News about

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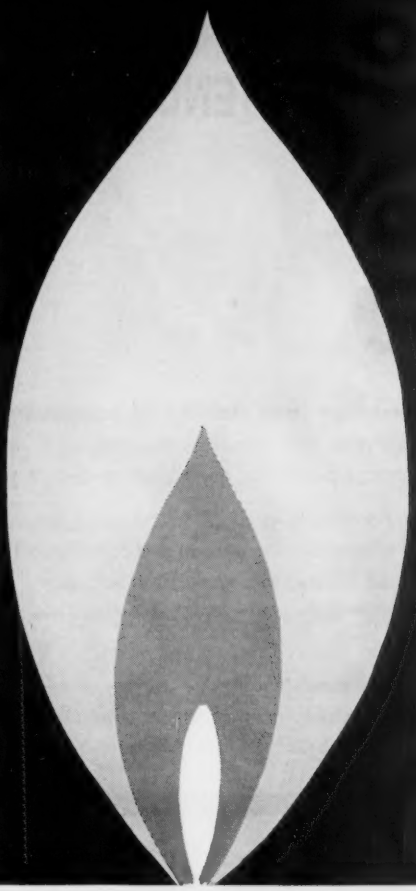

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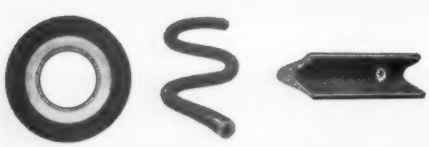

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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

JUNE, 1958 VOL. 83 NO. 3

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Highlights Sidelights *of the News...*

June, 1958

Approximately 900 members and guests of the Division of Rubber Chemistry, A.C.S., were in attendance at the meeting held in Cincinnati on May 14 to 16...The program for the meeting featured the presentation of thirty papers and included a symposium on "High Temperature Resistant Elastomers" as well as a meeting of the Twenty-Five Year Club and the Divisional banquet (page 498).

The United Rubber Workers have opened their annual wage drive in the rubber industry...The union is seeking "substantial and adequate pay raises, improved fringe payments and increased supplemental unemployment benefits...The Big Four, meanwhile, had asked the union to consider a proposal for a year-long industry-wide pay freeze...This proposal was turned down by the union's International Policy Committee (page 516).

The American Automobile Association has called for action from the tire industry and the Federal Trade Commission to clean up the "mumbo jumbo" that exists in the labeling and advertising of passenger car tires...AAA officials pointed out that while manufacturers have done an excellent job in developing tires, the motoring public is still entitled to know exactly what it is buying by present standards (page 501).

A new latex handling plant has been opened by the Polymer Corp. at Sarnia, Ont., Canada, as the latest addition to the company's expansion program...The $1.9 million plant has been under construction since 1957...The new plant is already producing "Polysar Latex 721", a new latex especially designed for foam rubber production (page 526).

Personalities in the news this month include L. H. Howland (U.S. Rubber), B. L. Johnson (Firestone), D. F. Behney (Harwick Standard) and Dr. Joseph C. Patrick (Thiokol)... Mr. Howland has been appointed assistant secretary of the Division of Rubber Chemistry, A.C.S., while Mr. Behney has been appointed assistant treasurer. Mr. Johnson has been named associate editor of "Rubber Chemistry and Technology" (page 504)...Dr. Patrick has been selected to receive the Charles Goodyear Medal for 1958 (page 508).

Goodrich has announced the development of a new synthetic, "Deuterio Rubber", which is expected to help scientists discover more about the properties of natural rubber...More rubbery than other rubbers, its unique molecular structure consists of heavy hydrogen (deuterium) atoms which replace the conventional hydrogen atoms attached to the carbon chains in the molecules of ordinary rubbers (page 502).

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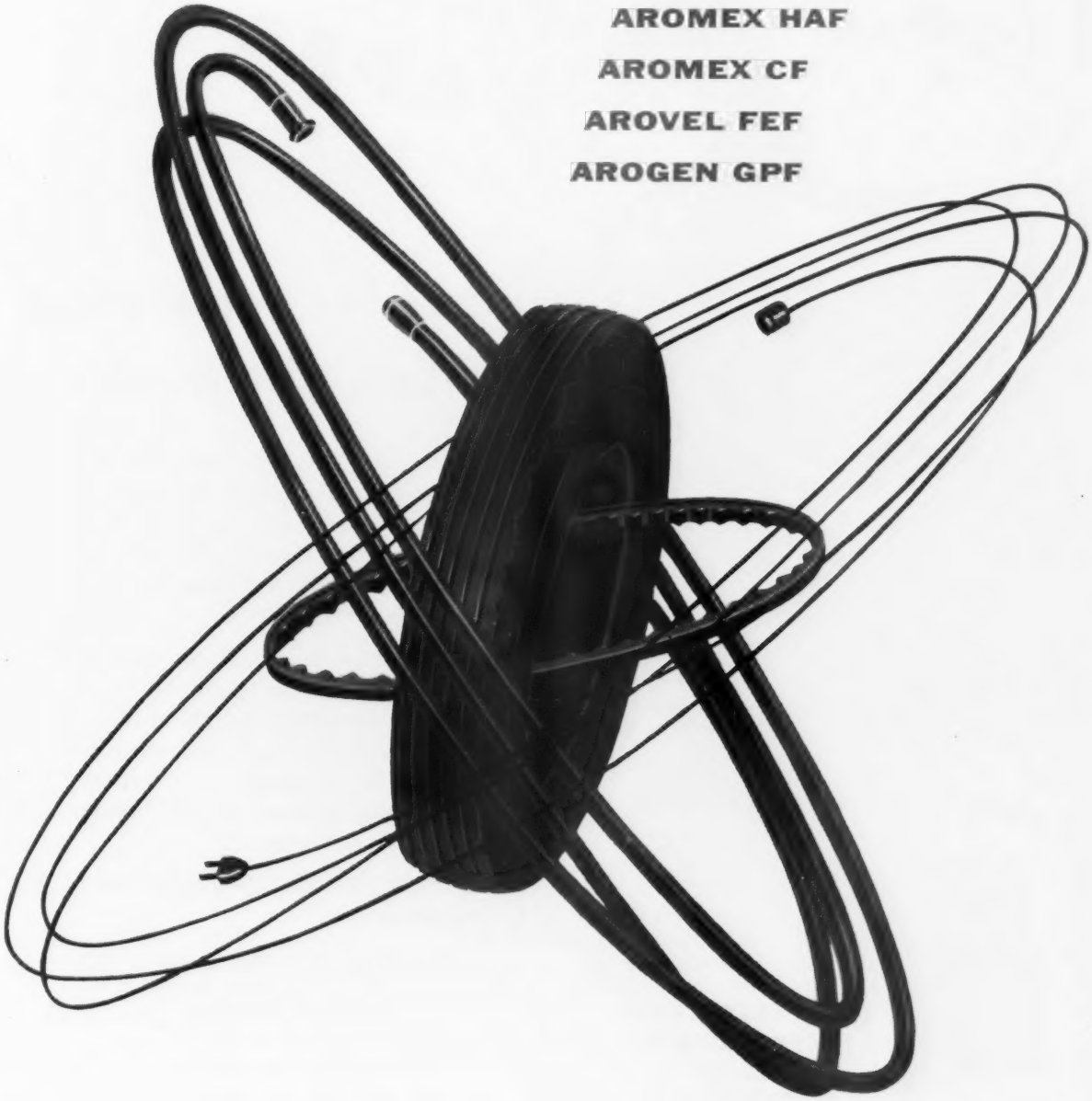

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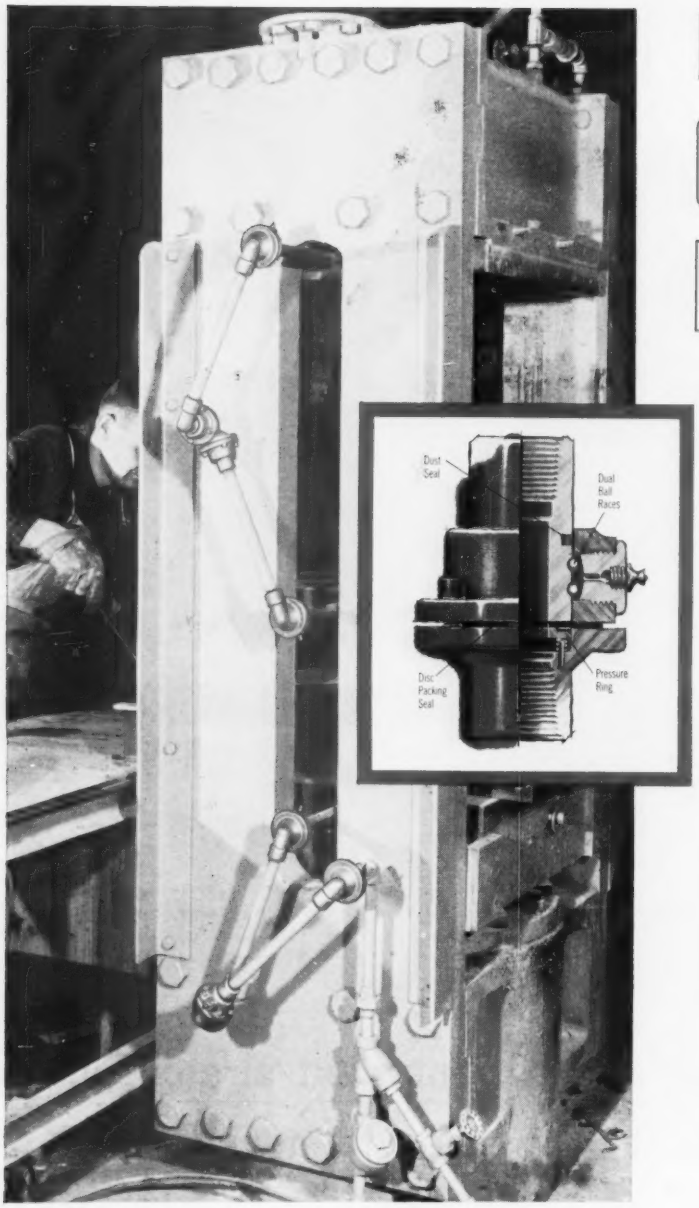

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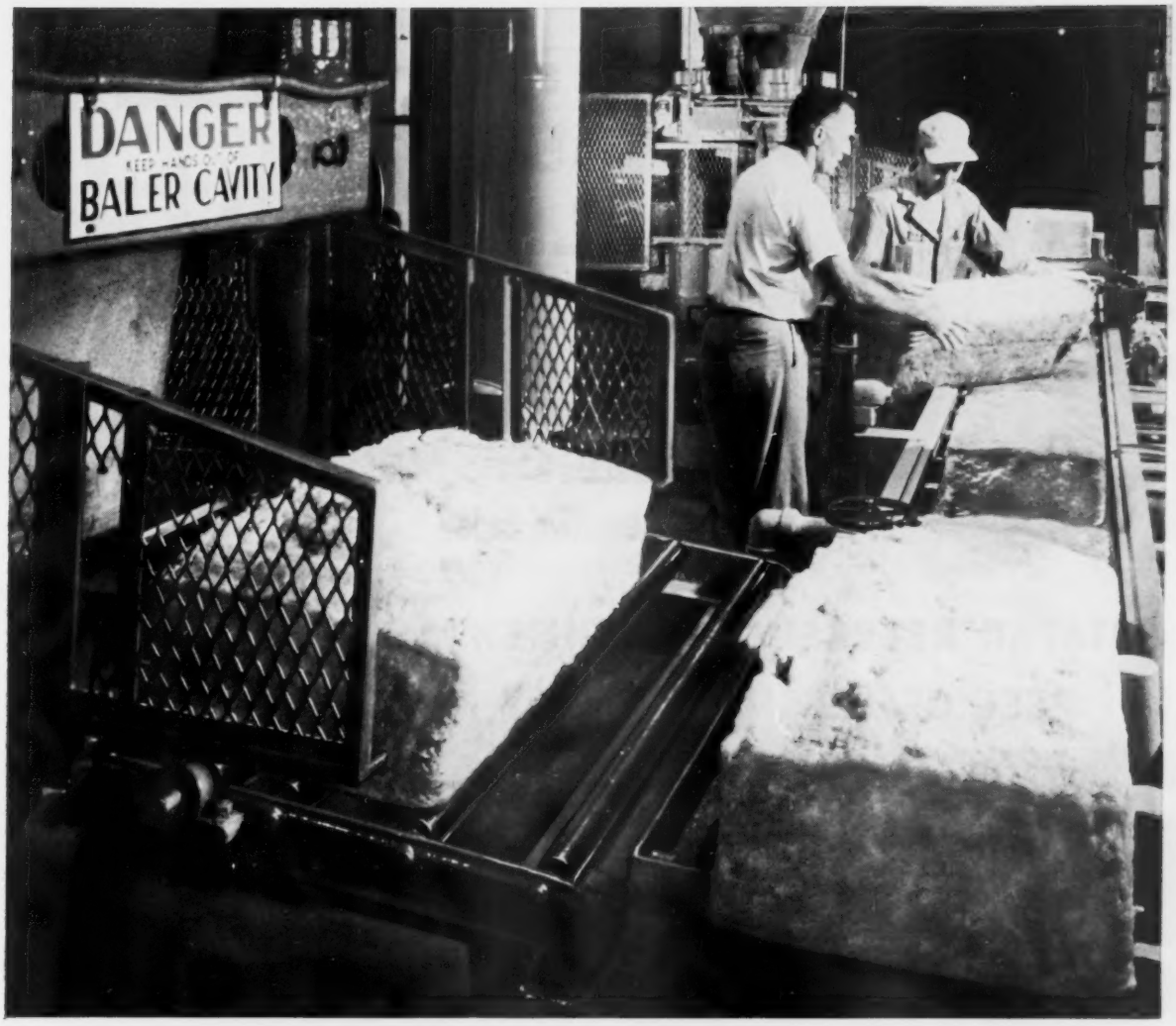

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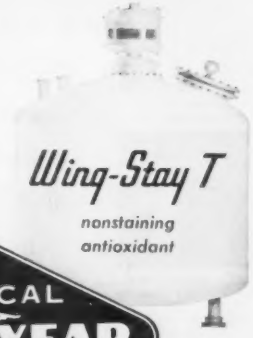

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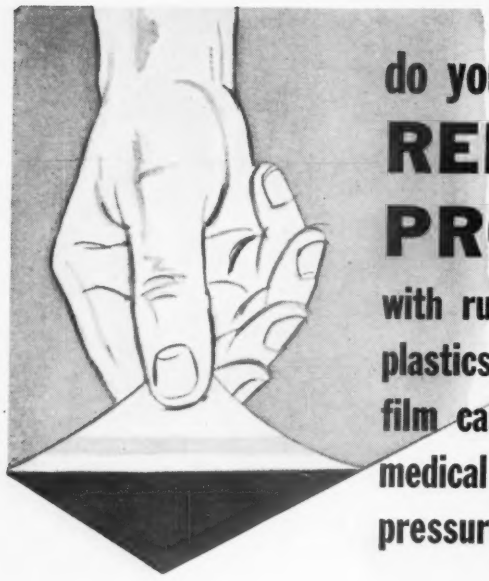

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Letters to the editor

More on Nomenclature

► The October, 1957, issue of RUBBER AGE carried an editorial in which we took issue with the system of nomenclature for synthetic elastomers proposed by Committee D-11 on Rubber and Rubberlike Materials of the American Society for Testing Materials. In subsequent issues, many letters have appeared commenting upon the editorial and voicing certain opinions on the problem. The letter which follows expresses still another opinion on the subject.

Dear Sir:

Concerning your editorial on nomenclature, I am in complete agreement that the designations proposed do not seem to be practical. I have just read your exposition and there you bring out the faults of the system so well that I have hardly any comment to add. It is evident that in conversations between technicians, one speaks currently of butyl, of neoprene, etc., and that the only exception has been GR-S in that GR-S has been replaced with SBR, since the letters GR-S no longer correspond with reality. The generalization of these abbreviations, however, can lead to nothing but confusion. Moreover, we can note that the letter "I" refers equally well to isoprene as to isobutylene. How then can we distinguish the possible copolymers isobutylene-butadiene and isoprene-butadiene, for example?

In the same way, if one uses dimethylbutadiene as a monomer, by what letters would it be designated? By a "D"? How then would you distinguish it from diethylbutadiene or with another which is homologous? One can remark also that the designation NR for natural rubber lacks logic, since the N, in this case, does not correspond to a chemical designation.

It is certainly indispensable to foresee a suitable framework permitting the classification of elastomers. But it is evident that a multiplication of the last chain of difficulties plus larger ones for the choice of letters designating monomers, will terminate in disorder. It appears to me that it would be much more rational to restrict the establishment of a classification on large chemical groups and to become interested, for example, in the plan I propose in my work, and in foreseeing the subdivisions necessary; but it is futile in my opinion to try to use abbreviations.

Please understand that these are my personal opinions and not those of any organization with which I happen to be connected.

J. LEBRAS

Paris, France

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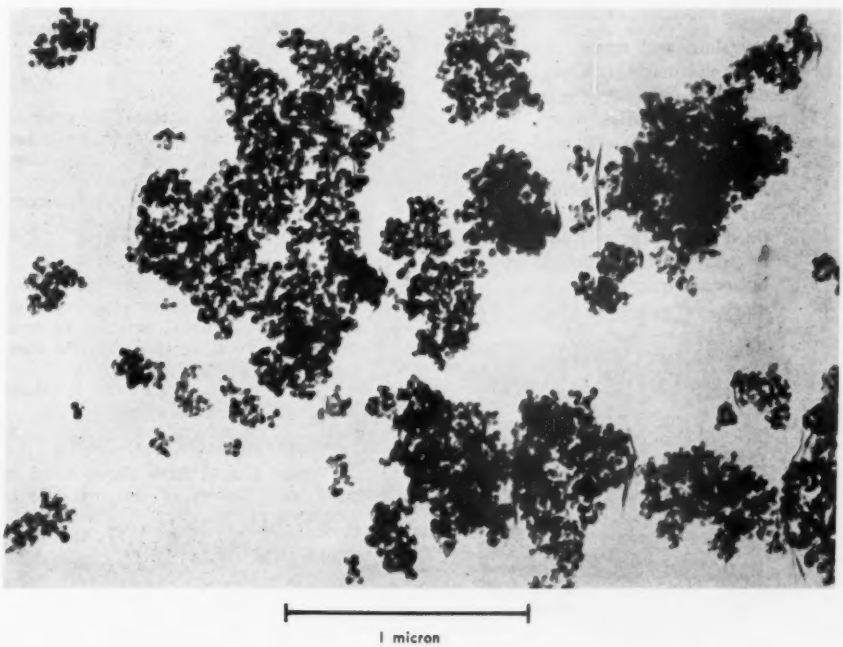

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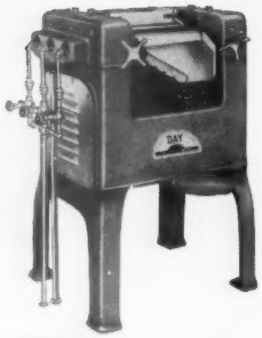

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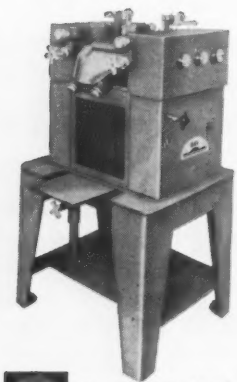

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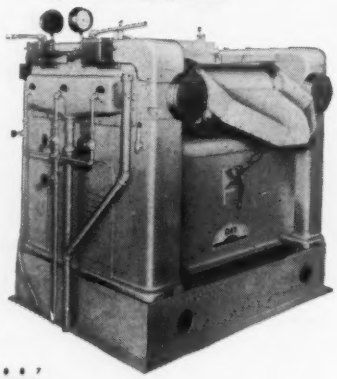

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Plant Vacation Schedules

► As a service to the rubber industry, the May, 1958, issue of RUBBER AGE, contained a listing of plant vacation schedules as announced by rubber manufacturers. Publication of this listing has met with a good deal of favorable response. The letters which follow are indicative of many received.

Dear Sir:
This is a very helpful service.

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... My congratulations! Another service to the industry from RUBBER AGE.

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... We all at Huber appreciate the amount of work you have gone to to compile this schedule. They are most helpful to we salesmen.

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J. M. Huber Corp.
New York, N. Y.

... A classic example of what publishers should be doing.

J. W. DOLSON
Hercules Powder Co.
Wilmington, Del.

... I want to congratulate you on publishing the rubber manufacturing industry plant vacation schedule in the May, 1958 issue.

C. S. HANCOCK
Diamond Alkali Co.
Cleveland, Ohio

... Very timely survey of the rubber industry with respect to plant vacation schedules. This should prove to be most helpful for many of us during the coming months.

G. E. GROVE
New Jersey Zinc Co.
New York, N. Y.

... Would like to have about seven or eight more copies of this schedule to pass on to our salesmen.

M. A. SPIEGEL
Glidden Co.
Baltimore, Md.

WRITE IT DOWN

The letters to the editor columns of RUBBER AGE are open to all our readers and we invite your comments on matters pertinent to the rubber industry or on RUBBER AGE itself. Before you forget it, write it down and send it to:

Editor
RUBBER AGE
101 West 31st St.,
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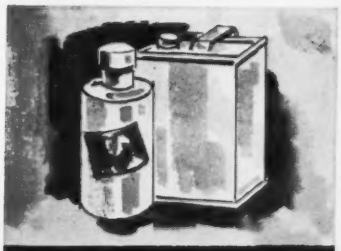

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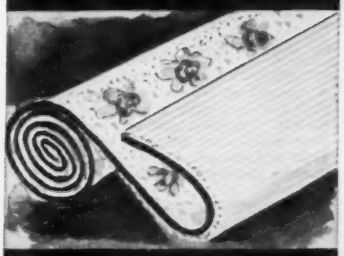
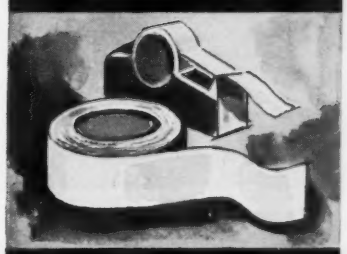
LATEX GOODS!



RUG BACKINGS!



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More and more manufacturers in various fields are turning to MARMIX for the essential qualities that make end-products more appealing, more practical. In *wax emulsions*, MARMIX contributes to increased film hardness and adhesion. When MARMIX is used in dipped *latex goods* your product has increased tear resistance, hardness and tensile strength; while in foamed latex goods, MARMIX offers improved dimensional stability plus such benefits as reduced shrinkage and a higher compression modulus. MARMIX also protects *rug backings* against warping or curling effects, and allows for higher pigment loading. *Paper products* employing MARMIX as a saturant or additive offer such important benefits as extra resistance to tear and delaminations, as well as greater protection against moisture, grease, oil and chemicals.

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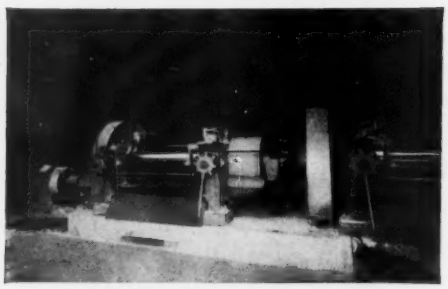
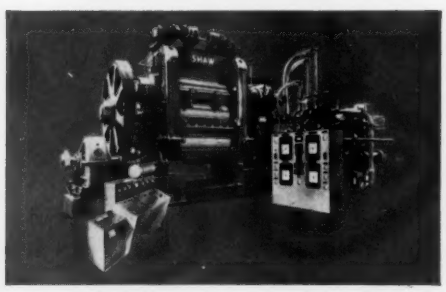
quality engineering puts efficiency into Shaw machines

The cost-cutting performance of every Francis Shaw machine and its thorough dependability are the result of long experience and unvaryingly high standards of engineering in every detail of manufacture.
Close-limit accuracy and rigorous inspection during manufacture guarantee to the user a consistently high quality output from Francis Shaw equipment.

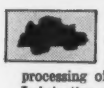


TWO-ROLL MIXING MILL For the efficient mixing and warming of all thermoplastic-thermosetting materials Shaw produce a range of mills from 13″ x 16″ up to 84″ x 26″. Supplied in batteries or with individual drives, these machines are capable of high sustained output. Single or double geared models available. The machine shown is fitted with Lunn Safety Gear.

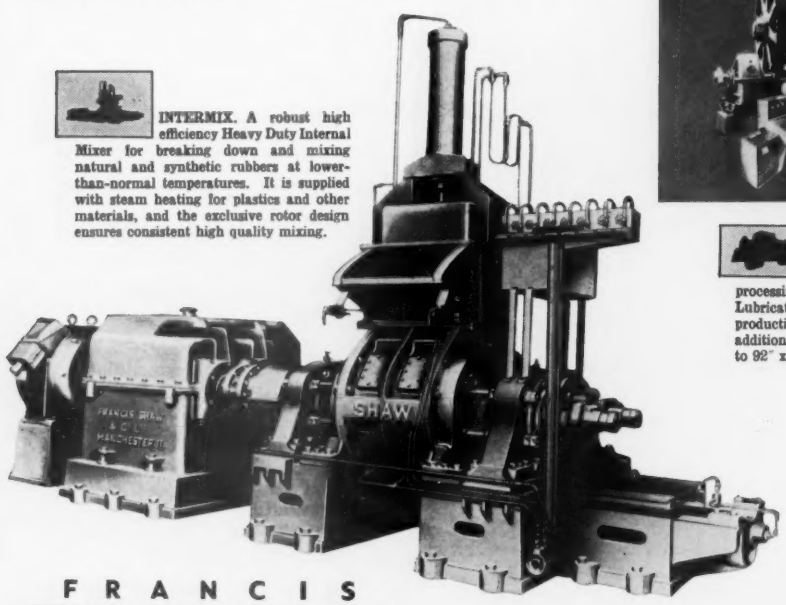
Francis Shaw are available for the design, manufacture and installation of a wide range of processing equipment



INTERMIX. A robust high efficiency Heavy Duty Internal Mixer for breaking down and mixing natural and synthetic rubbers at lower-than-normal temperatures. It is supplied with steam heating for plastics and other materials, and the exclusive rotor design ensures consistent high quality mixing.



CALENDER. A comprehensive range of Francis Shaw Calenders is available for the processing of all rubber and plastic materials. Flood Lubrication and hydraulic roll balancing available on all production sizes. Roll Bending can be fitted as an additional refinement. All sizes available from 13″ x 6″ to 92″ x 32″. Two-, Three, and Four-Bowl Designs.



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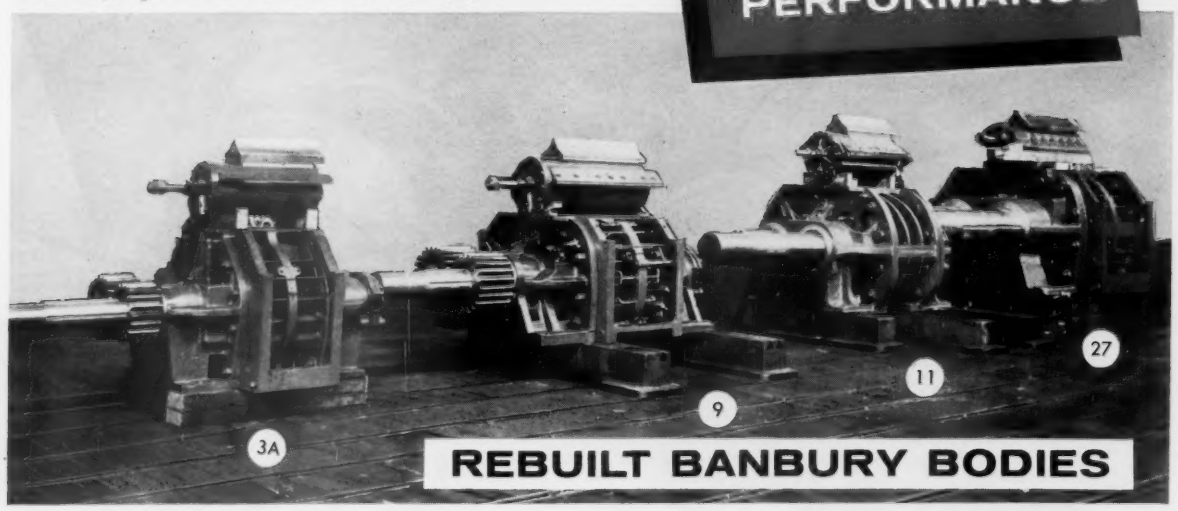

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COLD	PHILPRENE 1500 PHILPRENE 1502 PHILPRENE 1503	PHILPRENE 1600 PHILPRENE 1601 PHILPRENE 1605
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Worn body, on arrival at Farrel-Birmingham plant, being dismantled for cleaning and inspection.

How long should it take to rebuild a Banbury® mixer?

Long enough to do a job of such high quality that results can be guaranteed. No so long that you are ever needlessly inconvenienced.

To expedite rebuilding, a huge inventory of parts is maintained at Farrel-Birmingham. Even complete rebuilt and new bodies are stocked, and most sizes and types are generally available for immediate delivery. Smaller parts are shelf items in all sizes. All parts are interchangeable because they are machined to jigs and fixtures in accordance with the original plans from which the Banbury was made.

Rebuilt bodies cost less but carry the same guarantee as new ones. They should be reserved well in advance, because they are in considerable demand, especially for the annual plant maintenance shut-down period.

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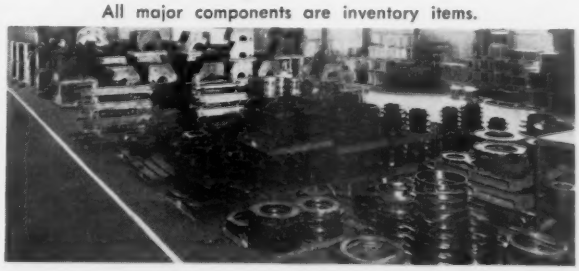
Farrel-Birmingham®

Rotors for all sizes are kept in stock.

All major components are inventory items.



Here's how UOP 88® and ... to protect your rubber

What you need to know about antiozonants today

When UOP 88 or UOP 288 is compounded into your rubber products, deterioration of the polymer by exposure to ozone is prevented by action of the UOP chemical antiozonant which continually migrates to the surface of the rubber article and there acts as a sacrificial ozone scavenger.

That's nutshelling it for you. Behind this simplification of how UOP 88 and 288 work is a vast network of factors to be taken into consideration. How long and how well the antiozonants will work for you depend on a knowledge of the differences in antiozonants and the factors involved in compounding.

Knowing the difference

Antiozonants vary widely in type and composition. One material may give quite satisfactory protection under static conditions but fail miserably under even modest flexing. Another will provide mediocre protection in static or dynamic service. UOP 88 and 288 however provide excellent ozone protection to rubber goods in storage and in use.

Proper application is almost as important as antiozonant selection. A windshield wiper blade formulation, tire compound or gasketing recipe will differ—sometimes widely—in composition; the service conditions of the finished article are equally diverse. In making recommendations for ozone protection all these factors must be evaluated. The conditions of use and service are of utmost importance in selecting the amount and means of antiozonant protection.

At Universal Oil Products Company some of the country's most able research scientists and technicians work constantly testing and improving the UOP family of antiozonants.

What influences effectiveness

Effectiveness of antiozonant compounds may be influenced by these major factors:

1. Type of polymer, natural or synthetic
2. Curing system used
3. Reinforcing agent used
4. Concentration of the compounding ingredients, including the antiozonant
5. Conditions under which the product is to be used, including:
   a. type of stress encountered (fixed or intermittent)
   b. ozone concentration
   c. temperatures

When the product is to be vulcanized, the choice of curing system is the most important single factor in obtaining maximum antiozonant performance. The formulation being used must be suited to the curing system or much of the antiozonant's protective action will be lost in vulcanization.

The type and concentration of carbon black used as a reinforcing agent also plays an important part in retention of antiozonant efficiency through the vulcanization phase.

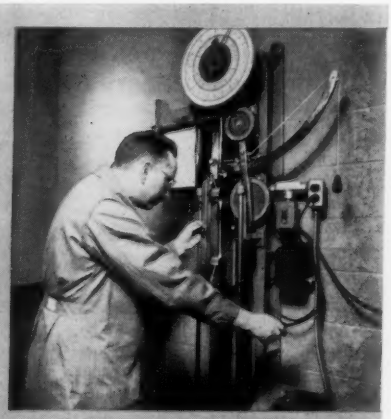
The concentration levels of the antiozonant must be related to other ingredients of the compounding recipe and to exposure conditions. Variations in type or concentration of ingredients reduce or enhance the final, lasting effectiveness of the antiozonant.

So you already use an antiozonant

Like most rubber goods manufacturers, you probably include some

Every day we test a number of rubber recipes. Exaggerated conditions of stress and ozone concentration in the oven assure complete protection under any normal conditions.

In the Universal rubber laboratory, a rubber mill is used to incorporate experimental UOP antiozonants in various rubber polymers.



The Scott Tester is used to measure physical properties of an experimental vulcanizate.

288® work products

kind of antiozonant compound in your product formula. What you may not know, however, is that the ozone damage problem is becoming progressively more acute and not all antiozonant compounds can cope with the increasing ozone levels. What served as effective antiozonant protection even a few years ago is inadequate today. Reported instances of deterioration of rubber goods due to ozone attack are often quite dramatic. In the Los Angeles area, where the ozone concentration is high, an unprotected rubber article may actually show ozone damage in a few days. In other large cities where ozone levels are not so high, ordinary base stocks may crack in a year or less even under static conditions.

UOP researchers have worked unceasingly and successfully to keep UOP 88 and UOP 288 compounds up to the demand placed on the antiozonant for utmost protection against this spiralling ozone load.

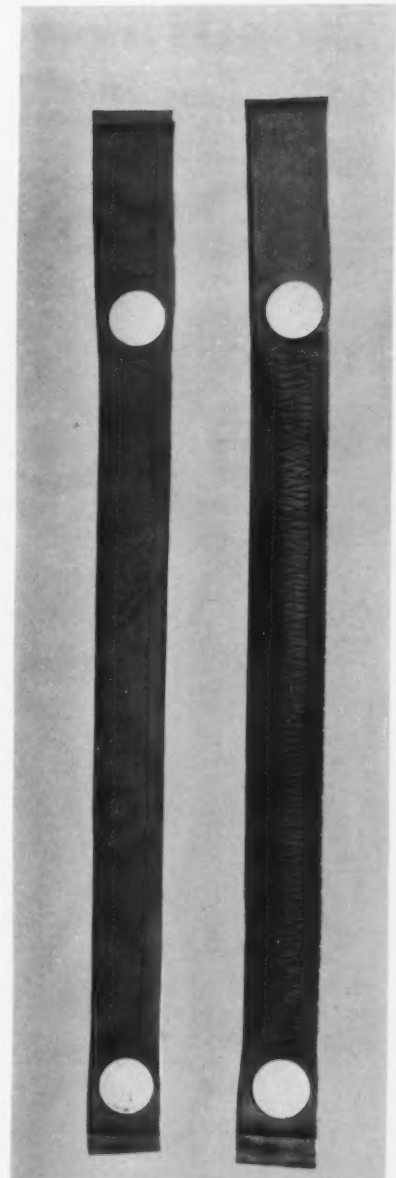
Here's proof

The UOP research laboratories are the scene of a daily battle against ozone. Through continuous research and arduous testing of thousands of antiozonant formulations in a variety of base stocks, you may be assured of absolute protection of your products when you use UOP 88 or UOP 288. In addition, many manufacturers have tested UOP antiozonants in their own laboratories and in use, have proved them to be superior. One of our tire customers recently reported that in a test of UOP 88 in their base stock, the UOP antiozonant afforded complete protection for 230 hours of exposure under fixed conditions of strain at 50 pphm ozone . . . much greater strain and ozone concentration than the tire would ever be subjected to in normal use. Comparatively, another antiozonant, used in the same recipe, failed and the tire cracked after only 30 hours of exposure. As a further basis of comparison, the unprotected base stock cracked in 5 hours.

How about your product?

You will get surer, more lasting protection of your rubber products with UOP 88 or UOP 288. For one little penny per pound of base stock these UOP antiozonants will perform for years to prevent ozone cracking, even under severe atmospheric exposure.

All UOP facilities and technical personnel are at your disposal for counseling on your particular antiozonant needs. A phone call, letter or wire will put them to work for you right away.



Rubber Strip Tests Show Effectiveness of UOP Antiozonants

The two rubber strips above were inserted in an ozone cabinet under identical, controlled conditions. The rubber in the sample shown on the right did not contain an antiozonant and reveals marked ozone damage. The SBR sample on the left contains two parts phr of a UOP antiozonant and reveals no ozone cracking after equal exposure.

UOP 88® and 288®

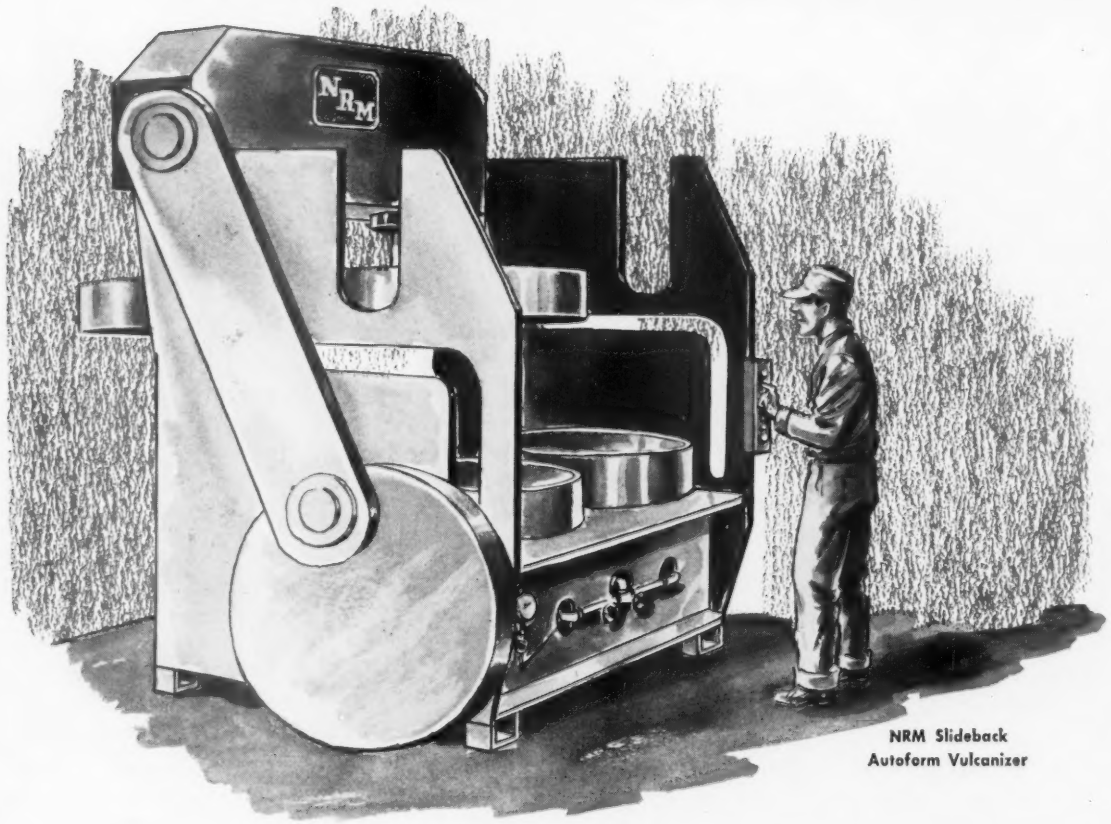
RUBBER ANTIOZONANTS

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road, Des Plaines, Illinois, U.S.A.

EXCITING NEWS FOR THE TIRE INDUSTRY...

NEW NRM Slideback bladder-type Autoform VULCANIZER



NRM Slideback
Autoform Vulcanizer

Two important new design features now make NRM Autoform Vulcanizers more productive and profitable than ever . . . The *Slideback* Autoform makes possible less expensive installation of automatic unloading arrangements, permits free access to molds, and provides for installation of automatic post inflators. Furnished either as a conventional bladder type press, or with the NRM bagless curing feature, it includes automatic blow-off, and costs no more initially than presses that do not provide for automatic unloading. One operator can handle up to sixty-five Slideback Autoform presses (130 cavities) in a normal cure cycle.

The NRM *Bagless* Autoform is the first successful application of the bagless curing principle. Developed in cooperation with one of the world's largest tire companies, it establishes new concepts in *faster* curing, at *lower cost* per cure. Here are some of the performance facts to remember about the Bagless Autoform, in planning expansions and efficiency improvements in your tire plant . . .

2884

New NRM SLIDEBACK Bagless AUTOFORM
SAVES UP TO 11½c PER TIRE ON CURING COSTS

That's the typical performance of the new NRM Bagless Autoform Vulcanizer. Making it possible is NRM's development of a new-type bead clamping device which permits using the tubeless liner of the tire being cured to hold the curing medium. Internal heating and cooling is thus applied directly to the tire carcass. Elimination of the bladder — along with associated costs in labor, materials and tire spoilage due to bladder failure — results in *faster* curing at savings that can range as high as 11½c per tire, or more. Here are a few of the many other ways the Bagless Autoform reduces curing costs and simplifies operations:

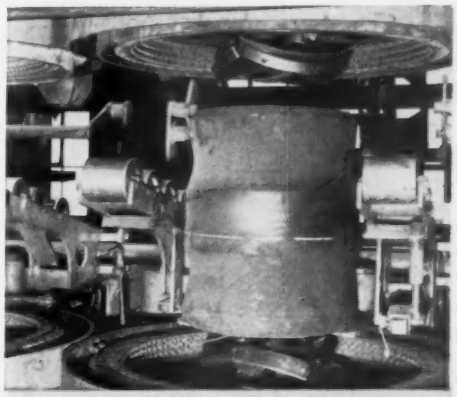
1. Simple construction — Uncomplicated design of the new-type bead clamp assures positive action and minimum maintenance.

2. Complete Flexibility — The bead clamp permits curing all passenger tire sizes of the same bead diameter with the same clamp ring, by allowing for adjustment of bead ledge widths to accommodate changes in tire construction. Specially compounded *resilient* faces on the bead clamps compensate for all normal dimensional variations in the beads, providing for consistently perfect bead molding.

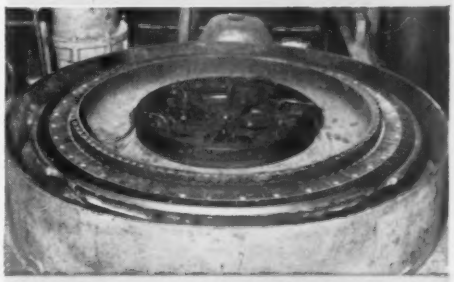
3. No Mold Alterations Required — Present tire molds may be used in bagless curing without changes.

4. More Efficient Loading and Unloading — The Bagless Autoform, combined with Slideback design, permits installation of less complicated, smoother-working automatic loading arrangements.

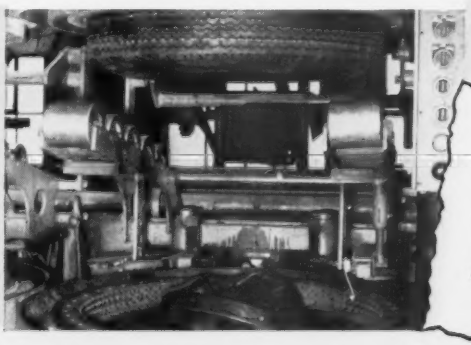
HOW CURING COSTS ARE REDUCED . . . PROFITS INCREASED . . . with their capacity for 90 or more cures per day per mold, the Bagless Autoform offers the tire industry more productivity per foot of floor space than any other vulcanizer available. In addition to this greater production capacity — and therefore greater *profit-making* capacity — are the many separate savings in material and labor that result from the elimination of bladders. Together, these represent savings up to 11½c or more per tire on curing costs.



The green tire is automatically placed in the vulcanizer. The bead clamps here seen in retracted position expand as the press closes, gripping the beads and positioning the tire for curing.



This cut-away tire shows position of the bead clamps during curing. Resilient facings on the clamps compensate for dimensional variations of the beads, assuring consistently perfect bead molding.



After curing, the bottom clamp retracts and the tire is lifted by the upper clamp rings, then dropped to the conveyor for automatic unloading.

Our engineers will be happy to discuss Slideback and Bagless Autoform Vulcanizers with you in complete detail, and assist in helping you plan for automatic, bagless tire curing in your plant. If you are now using bladder type Autoform Vulcanizers, they can be easily converted to bagless operation.

NATIONAL RUBBER MACHINERY COMPANY NRM

Creative Engineering

General Offices and Engineering Laboratories: 47 W. Exchange St., Akron 8, Ohio
EAST: Plants at Akron, Columbiana and Leetonia, Ohio—Clifton, N. J.
WEST: S. M. Kipp, Box 441, Pasadena 18, Cal.
MID-WEST: National Rubber Machinery Co., 5875 N. Lincoln Ave., Chicago 5, Ill.
EXPORT: Gillespie & Company, 96 Wall St., New York 6, N. Y.

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HOLMES
HYDRAULIC
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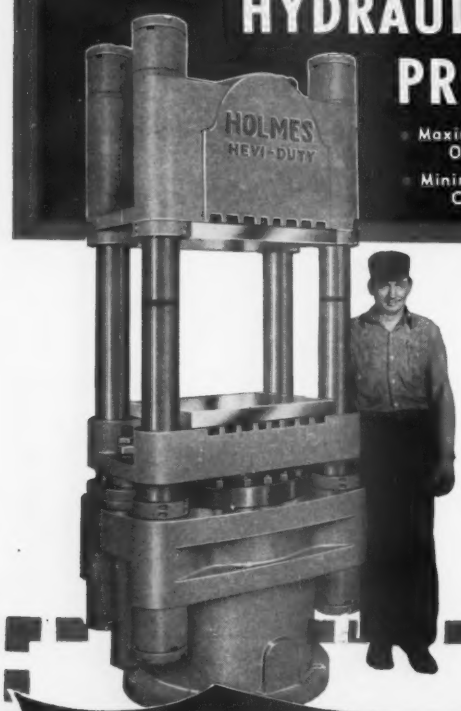
• Maximum Output
• Minimum Cost



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The new and improved Holmes Hydraulic Press retains all the features of its famous predecessors... PLUS...many outstanding improvements. These put it in a class by itself--for all kinds of general purpose work...and...special production where close tolerance is required. Low in price. Practically no maintenance. Will quickly pay for itself in any processing plant.

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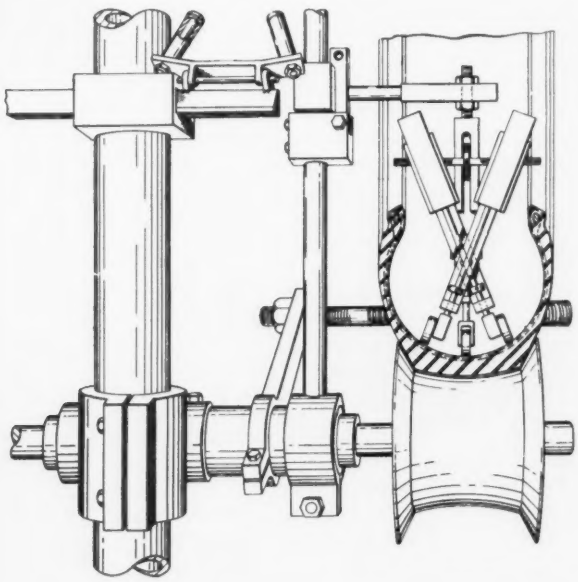
Stanley H. HOLMES Company
Successor to Holmes Brothers, Inc.
3300 W. Lake Street, Chicago 24, Ill.

PATENT REVIEW

by Melvin Nord

Measuring Variations in Tire Thickness

U S. PATENT 2,812,583, issued November 12, 1957 to Franz Herzegh and assigned to B. F. Goodrich Co., describes a device for predicting thump characteristics of tires, and for locating the offending parts. This is accomplished by measuring variations in the thickness of the tire tread.



As shown in the schematic, the apparatus contains three presser feet in the form of small ball bearing rollers which engage the inside of the uninflated tire directly over a large supporting roller. The tire is rotated, and variations in tread thickness cause movement of the presser feet. This motion is recorded against tire rotation, on three strips of uniformly moving paper.

Rubber in Bituminous Asphalt Road Material

U. S. PATENT 2,809,179, issued October 8, 1957, to Herbert A. Endres, James W. Shaw, Jr., and Harold B. Pullar, assigned to the Goodyear Tire & Rubber Co., relates to the use of rubber in bituminous asphalt for road construction.

The use of a small amount of rubber substantially reduces the temperature susceptibility of the asphalt, and adds other desirable qualities to the pavement. The percentage of rubber must be small, because of its relatively high cost. Since its effect is primarily physical, the distribution of the rubber in the asphalt must be as

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and brighter pastels...

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The Best Method Yet Devised...

FOR DICING SHEET STOCK

The Famous CUMBERLAND "Stair-Step" Dicer

Here at last is the answer to your problems of dicing rubber or vinyl sheet stock. Produces perfect cubes ranging in size from ⅛ to ½" by merely changing knives.

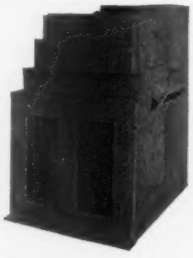
Comes in two sizes designed to handle sheets up to 7" or 14" in width. Other sizes made to order.

Input speeds range from 10 to 125 feet per min. depending on material and size of cube desired.

The CUMBERLAND Rotary Chopping and Dicing Machine

As a chopper, this machine efficiently cuts rubber and vinyl slabs into small pieces. Two sizes available to handle stock widths up to 14 or 24 inches.

As a dicer in modified form, handles principally vinyl sheet stock. A less expensive machine though less universal than the "Stair-Step" Dicer shown above.



For Granulating Plastic . . .
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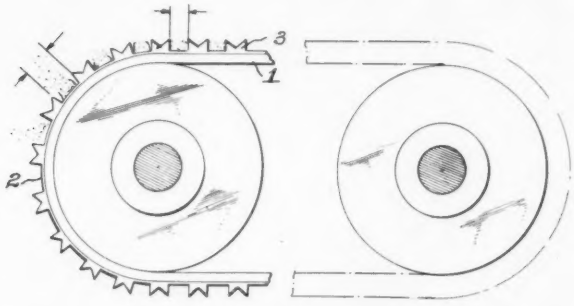
Builders of Better Machines for the Rubber and Plastics Industry

PATENT REVIEW

complete and uniform as possible, in addition to being rapid. This means that the rubber powder must be finely divided and free-flowing. In order to accomplish this, a water suspension of a mineral composition containing barytes is combined with rubber latex and then co-precipitated by means of a coagulant. The precipitated compound is filtered, dried, and pulverized. The product is inexpensive, easy to handle because it is free-flowing, and readily disperses in asphalt.

Conveyor Belting

U.S. PATENT 2,815,850, issued December 10, 1957 to E. S. Davis, and assigned to New York Rubber Corp., describes a conveyor belting in which the form and spacing of cleats enables the belting to be used at an exceptional angle of inclination without slippage of articles on it.



In the diagram, the flexible strain resisting base (1) is shown as consisting of several layers of plies of rubber impregnated fabric, while the carrying surface (2) is composed of rubber. Spaced across the latter throughout the belting length are cleats (3) which have substantially vertical side walls that terminate in angled surfaces, so that the tops of the cleats take the form of V-grooves with sharp edges. The spacing of the cleats is slight, e.g., approximately equal to the width of the cleats, to provide both large supporting area and abundant frictional gripping of articles transported by the belting.

In operation, the sharp edges of the V-grooves in the tops of the cleats engage the articles to be forwarded by the belting and, due to their positive engagement, permit the use of the belt at a greater angle to the horizontal without slippage of the articles. Practical tests have shown that articles having cardboard, wood, and steel casings and of varying dimensions and weights, can be forwarded by this belting upwardly at an inclination of 47 to 53 degrees without slippage.

Another feature of this invention is that the flexing of the belt as it passes over its wheels or pulleys facilitates the discharge of particles or other foreign matter lodged between the cleats. This leads to longer life and efficiency. The flaring of the sides of the cleats and the slight in-

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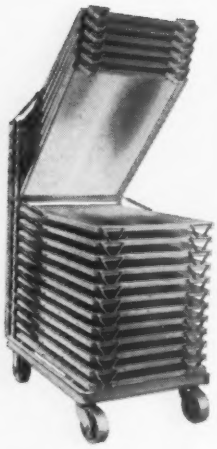

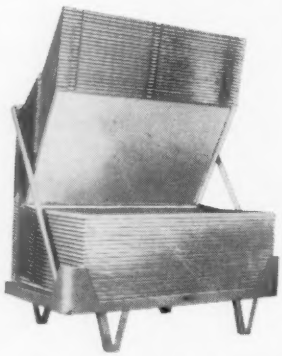

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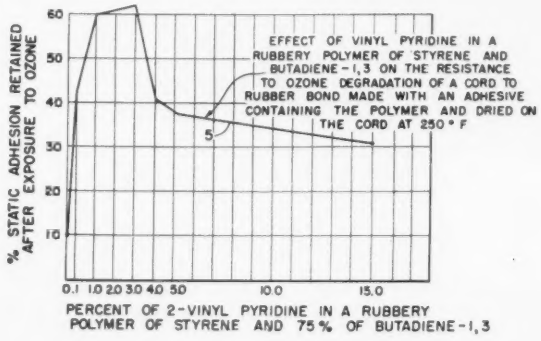
PATENT REVIEW

crease in their spacing is illustrated in exaggerated form in the illustration, and pointed out by the radial lines and arrows, as is likewise the discharge or spilling out of the particles entrapped between the cleats. This function is promoted or facilitated by the comparatively high flexibility or elasticity of the rubber supporting or carrying surface and the cleats as contrasted with the resistance of the fabric base.

Bonding of a Cord to Rubber

U.S. PATENT 2,817,616, issued December 24, 1957 to William D. Wolfe, assigned to Goodyear Tire & Rubber Co., describes new adhesive compositions useful in the bonding of a cord to rubber.

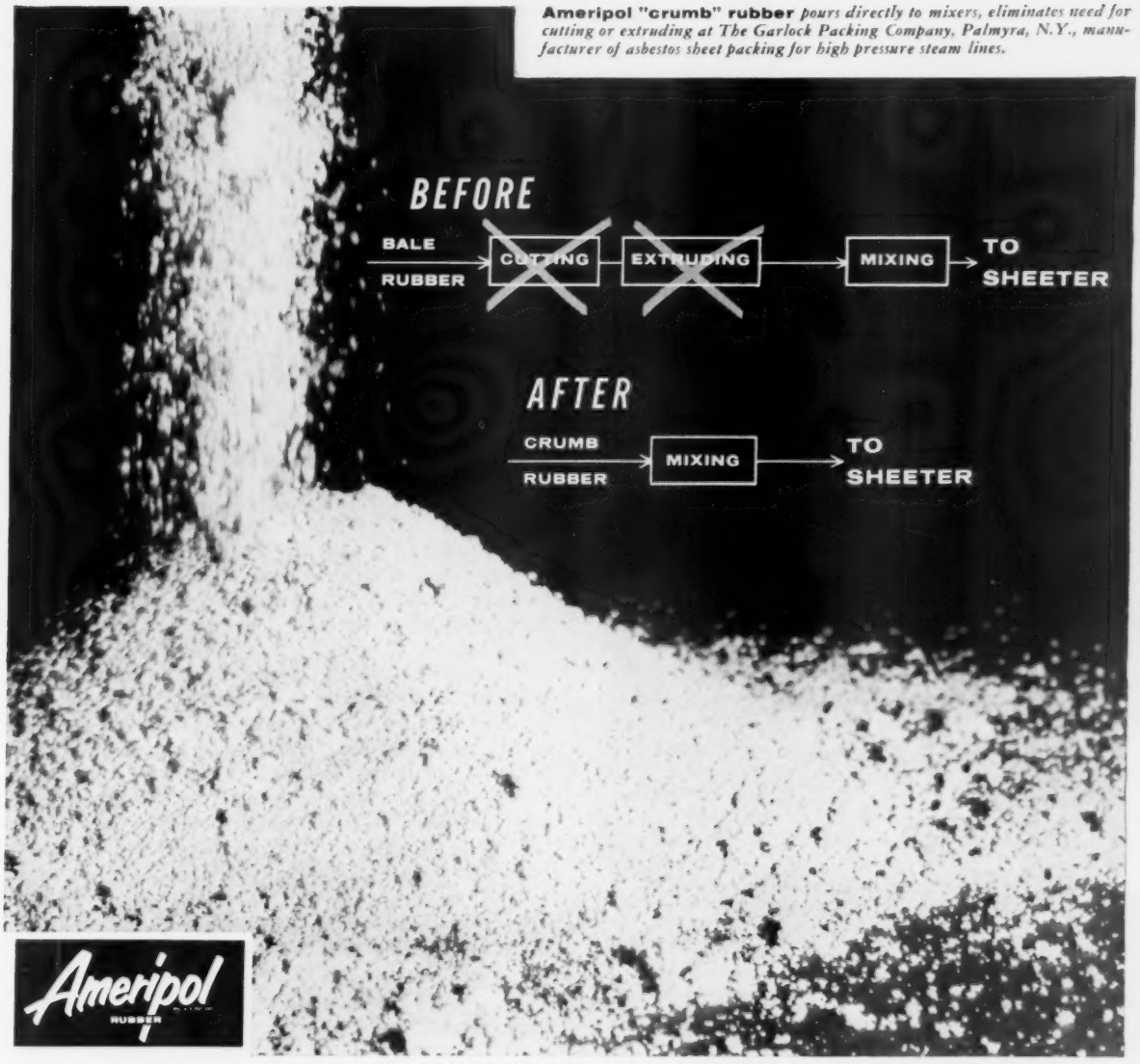

% STATIC ADHESION RETAINED AFTER EXPOSURE TO OZONE
60
50
40
30
20
10
EFFECT OF VINYL PYRIDINE IN A RUBBERY POLYMER OF STYRENE AND BUTADIENE-1,3 ON THE RESISTANCE TO OZONE DEGRADATION OF A CORD TO RUBBER BOND MADE WITH AN ADHESIVE CONTAINING THE POLYMER AND DRIED ON THE CORD AT 250° F
5
0.1 1.0 2.0 3.0 4.0 5.0 10.0 15.0
PERCENT OF 2-VINYL PYRIDINE IN A RUBBERY POLYMER OF STYRENE AND 75% OF BUTADIENE-1,3

The inventor states that the desired bond between a cord, particularly a rayon or nylon cord, and rubber can be achieved when using a rubbery copolymer of butadiene and styrene which has been polymerized in the presence of a vinylpyridine monomer. As little as 0.1% of the vinylpyridine monomer was found to produce a desirable change in the resulting rubbery polymer of butadiene and styrene, which permitted the use of the rubbery polymer under aggravated ozone conditions as well as without failure of the bond at high temperatures. The graph shows the effect of additions of 2-vinylpyridine on ozone resistance.

Method of Making Dipped Goods

U.S. PATENT 2,814,834, issued December 3, 1957 to Newman W. Hess and William F. Dacey, assigned to United States Rubber Co., describes a method of making dipped goods consisting of polyurethane elastomer.

The invention is based on the discovery that dipped articles of controlled thickness and of uniform, smooth appearance can be produced by dipping a suitably shaped form successively in a liquid polyester-diisocyanate intermediate reaction product and a diprimary diamine. The action of the diprimary diamine on the polyester-diisocyanate intermediate on the form is such that the intermediate is converted into a cured, non-tacky



Ameripol "crumb" rubber *pours directly to mixers, eliminates need for cutting or extruding at The Garlock Packing Company, Palmyra, N.Y., manufacturer of asbestos sheet packing for high pressure steam lines.*

eliminates two processing steps; cuts mixing time in half!

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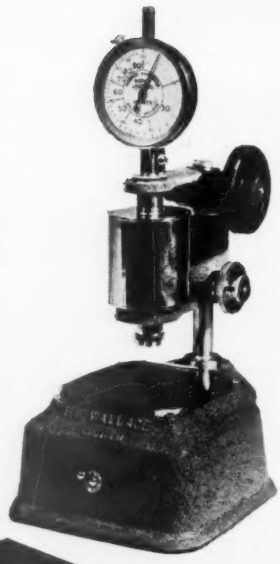

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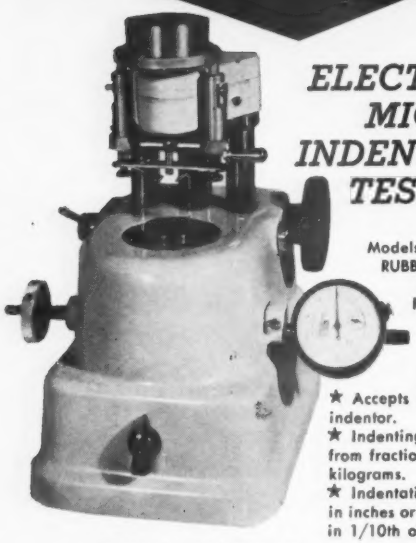

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PATENT REVIEW

rubbery condition, and the resulting article is characterized by unusual tensile strength and great resistance to wear, even though the finished article may be extremely thin. The invention utilizes a dipping form made of a material that is easily uniformly wet by the polyester-diisocyanate intermediate composition, thereby insuring that a uniform film, free of voids, or irregularities, is deposited. This is accomplished by using a form surfaced with plasticized polyvinyl chloride.

Elastomer Compositions

U.S. PATENT 2,814,604, issued November 26, 1957 to Robinson F. Nichols and Robert O. Weisz, assigned to B. F. Goodrich Co., discloses compositions containing finely divided pigment grade white dioxide and polyurethane condensation elastomers, in which the hot stress-strain properties of the elastomer composition are improved.

For example, these vulcanizates have a room temperature tensile strength of 7000 pounds per square inch, a 300% modulus of 1900 pounds per square inch and an elongation of 700%; and a tensile strength at 212°F. of 3400 pounds per square inch and an elongation of 975%. For comparison purposes, when a similar compound is made with equivalent amounts of "arc" silica, the tensile strength at 212°F. is only about 200 pounds per square inch.

Other Patents Of Interest

Subject	Inventor or Assignee	Patent No.	Date
Method of constructing containers composed of a metal reinforced rubber sheeting	Dayton Rubber Co.	2,797,178	6/25/57
Rubber tire valve assembly	B. F. Goodrich Co.	2,798,528	7/9/57
Divided rim and valve stem assembly for tubeless tires	B. F. Goodrich Co.	2,798,529	7/9/57
Controlling the vulcanization of rubber with N,N'-arylene nitroso compounds	Monsanto Chemical Co.	2,798,860	7/9/57

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.

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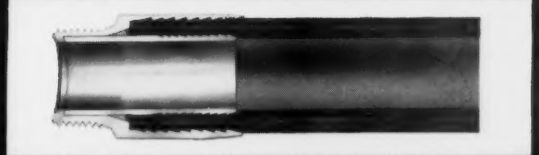

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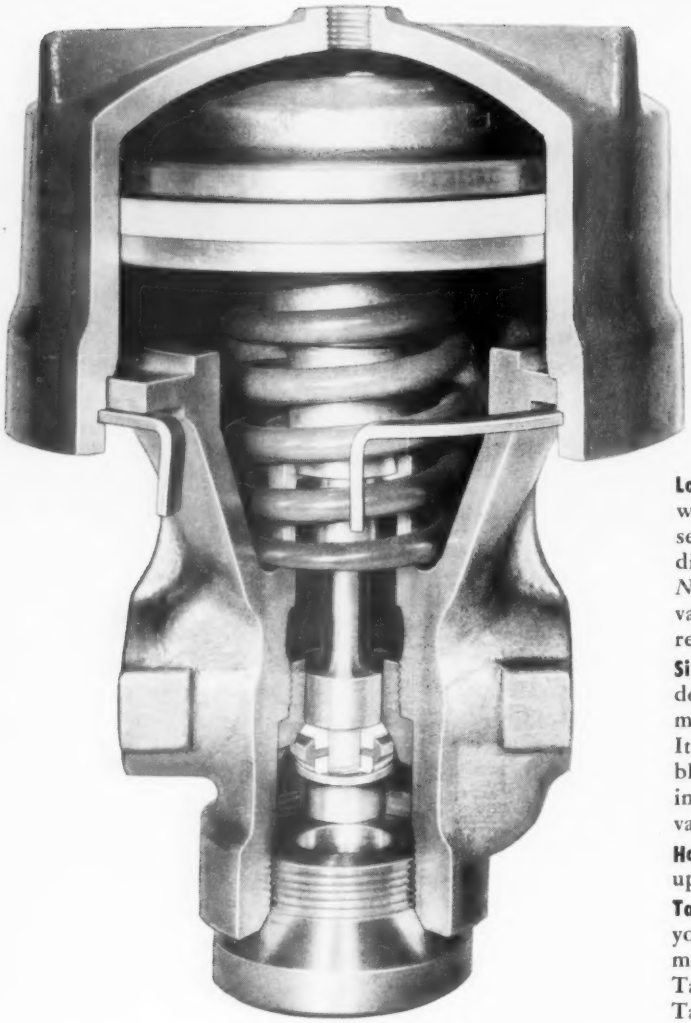

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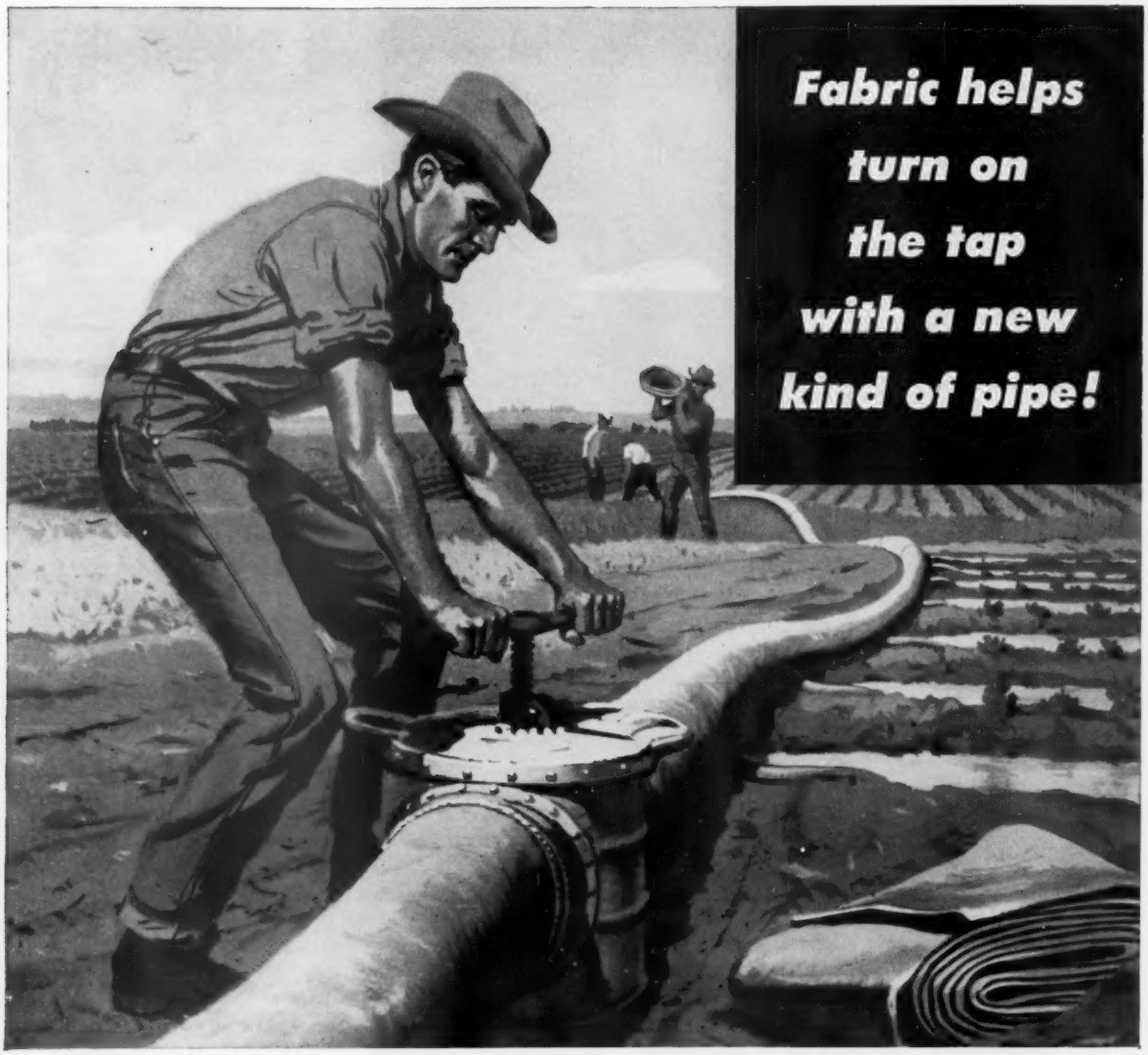

A specially "engineered" nylon fabric for combining with butyl rubber was developed by Wellington Sears for the Carlisle Tire & Rubber Div., Carlisle, Pa. Wellington Sears supplied only the base fabric—not the finished piping.

With a new kind of pipe hauling water for them, farm owners may soon have irrigation usually considered way beyond their reach. Made of a specially woven nylon fabric in combination with butyl rubber, this pipe eliminates much of the cost of equipment, ditching, and other ordinary details, and provides an easily assembled, easily knocked down water carrier. It is durable, water tight, resists erosion and eliminates water losses due to seepage and evaporation. It costs less, carries more. And it can be moved easily from place to place: a 50-foot link weighs approximately 50 pounds.

Whether it works on the farm or in the factory, fabric is doing a bigger and bigger job these days. The nylon used in this irrigation system is just one of the many fabrics made for industry by the mills of West Point Manufacturing Company, and supplied by Wellington Sears. It represents over a century of experience in industrial textiles of all kinds, a record of service which means problem-solving help for you, on call. Just let us know. For informative booklet, "Fabrics Plus," write Dept. G 6.

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...and when you see how
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perform for you, you'll know that the rubber man's best friend is really Witco. There are channel and furnace grades exactly right for every formulation...top manufacturing standards to insure economy and uniform quality... first-class technical service laboratories to help you with your problems. Any way you look at it, you can't buy better than Witco.

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COLOR IS THE KEYNOTE for fast-selling protective and antifatigue mats. Car owner and housewife alike demand *color* to harmonize with automobile and home décor.

For brilliant colors that last . . . and economy too . . . there is no better rubber than Shell S-1006 (hot) or S-1502 (cold). Both are light-colored, non-staining and well-suited for white or colored products of all kinds.

The Shell Chemical plant at Torrance, California, is your source of a full line of butadiene-styrene synthetic rubber . . . hot, cold, oil-extended and black masterbatch, as well as hot and cold latices.

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Synthetic Rubber Sales Division
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SHELL

Capitol Cues

ECONOMISTS ARE WATCHING THE CONSUMER and his spending for a tipoff as to which way business is really heading. Climbing government spending is just about offsetting declines in outlays for new plant and inventory. So the consumer is now the swingman who can tip the balance either way—to recovery or more slide—depending on whether he steps up or cuts back. Conflicting forecasts center in differences as to what consumers will do.

Most economists are concerned at the way retail sales dropped after 1958 began, reflecting job layoffs and short workweeks. The drop started manufacturers worrying about inventories; so they have been adding to layoffs, to reduce stocks. The big danger that's seen is a chain reaction of still more cuts in buying...more cuts in inventory...jobs...income...buying, etc.

The President and his advisers are convinced that the recession is running out of steam. They see growing resistance to further declines—in the consumer's area as well as in that of industry. This is why they are so opposed to cutting taxes. And they are sure that the next two or three months will prove them right.

DON'T COUNT ON PRICE CUTS TO HALT THE RECESSION, say price experts in government and industry. A substantial number have been made, especially in hard goods, with little improvement in sales resulting. So industry sees little point in really determined cuts. Besides, many durables have little margin left for cutting. Soft goods are actually rising in price, over-all.

CORPORATE PROFITS ARE REALLY SLUMPING these days, according to the first 1958 reports of hundreds of U.S. firms—big and not so big. Two out of three outfits had smaller earnings in the early months of 1958, compared with the same period of '57. Lower sales were responsible for the profits slump, at a time when labor and materials costs were still high or rising.

The declines ranged as high as 40% and 50% for the railroads, steel, machinery, rubber, chemicals, and coal. The only lines to show increases were food, beverages, and tobacco, utilities, finance, and aircraft—recession-proof industries generally.

For 1958 as a whole, it now looks as if corporate profits will be $34 or $35 billion—some 20% under last year's $41 billion. This would be the lowest level since 1954. It will cut deep into Treasury revenues, and produce reductions in dividends.

INTEREST RATES WILL FALL STILL MORE this year—maybe to near levels reached in 1954, at the depths of the country's last recession in business. It won't be because of action by credit controllers at the Federal Reserve, either; their recent steps to ease money are all they intend to take now. (The Federal Reserve's action has already knocked rates down more than 1%.)

Natural market forces will bring about the future easing.

- The supply of credit will be expanding as the Budget deficits rise and the U.S. borrows to pay—in effect, creating money.
- The demand will shrink as businessmen cut their inventory and need less capital in financing the reduced outlay for plant.

Commercial bank rates will fall faster than long-term rates.

(Continued on Next Page)

A HUGE DOCKET OF TAX LEGISLATION—the bulk of it of direct concern to business—still faces Congress as this session enters the home-stretch. Some of the proposals pending have been much talked about—a general slicing of rates on individual income, for example. But there are others, important in their own way, that have been obscured by the debate over the tax policy best suited for a recession. These have much Congressional support, too.

It's clear now that not all the measures can be considered, let alone passed, in the time that remains. (Don't forget: this is a Congressional election year and lawmakers won't be in Washington beyond August.) This means that many bills—some of unquestioned merit—will die. Here is the outlook:

EXTENSION OF CERTAIN "KOREAN" TAXES, which automatically expire on June 30, is the one piece of tax legislation that's certain to be enacted. Even those who have favored tax cuts as business stimulants agree that these expiring levies aren't the best way of granting relief. So a bill to extend at least part of them will get a clear track from leaders of both parties.

- Corporate rates, under present law, are due to fall from the current top of 52% to 47% on all income over $25,000. This would reduce the Treasury's revenues by about $2 billion.
- Excise taxes on liquor, beer, wines, cigarettes, and autos and accessories would be reduced, costing some $900 million.

As noted, this particular set of reductions won't be allowed.

THE PUSH FOR ANTI-RECESSION TAX CUTS will get its last opportunity when the extender bill comes up for action. Once it reaches the floor for debate it will be open to amendment; virtually any kind of program could be tacked on, bringing the issue out in the open for a final showdown vote—up or down. It might take all of Ike's power and prestige to shut the Pandora Box again.

ODDS ON TAX RELIEF FOR SMALL BUSINESS increase as prospects for the anti-recession cuts diminish. Giving little firms a break appeals to many Congressmen for several reasons: (1) It would enable them to do something this year, as a substitute for broad cuts, and (2) it would advance their positions on the hot political issue of small business. What's more, the President has initiated such action. Cost to the Treasury will be slight.

The House Ways and Means Committee has given this program a good start, scheduling it ahead of other pending measures.

The President has urged four kinds of relief for small firms:

- Ordinary loss deductions—not smaller capital losses—should be permitted on investments in the stock of small companies.
- Accelerated depreciation for used equipment up to $50,000 a year would be allowed—such as now applies for new items.
- Partnership treatment should be granted small corporations.
- Payment of estate taxes should be permitted over 10 years in cases where an estate consists largely of an investment in a closely held business, which might otherwise be liquidated.

Tax experts in Congress think this program has a 50-50 chance of passage this year, even though it got off to a late start.

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POLYMEL RC 57

A free flowing Powder that salvages scrap and waste rubber

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Polymel RC 57 has been found to give excellent ply adhesion when compounded with synthetic or natural rubber. It's more than a tackifier and plasticizer - - it really forms an amalgam. Use Polymel RC 57 to salvage much that would be waste from trimmings and losses from scorched materials. Cuts plant costs sharply and increases production!

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Add 2½ to 3% Polymel RC 57 to synthetic or natural rubber stocks which have become scorched - - or have become partially set. After milling until smooth - - use them exactly as fresh stock.

SALVAGING MOLD TRIM

Grind the mold trim on a tight mill and add very slowly 8 to 10% Polymel RC 57 to the shredded trim, mill together until mass is homogenous. When mixing new batch of same material, add 10% of the reclaimed trim. There will be no change in the hardness or time of cure of the new batch.

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SUMMIT MINING CORPORATION CARLISLE, PENNSYLVANIA

One of a Series on Man and the Development of Transportation

Greased Runners On Cobblestone

From time immemorial man has used the sledge as a means of transportation, from Egypt to the Arctic. Even today the sledge still is used: for example, on the island of Madeira one can see the very picturesque "carros" or bullock sledges which glide over basalt cobblestone on greased runners.

In ancient times, the sledge was a "prime mover" for heaviest tasks. It is recorded that the Egyptians fashioned two marble obelisks for Queen Hatshepsut, each of which was 97 feet in length and weighed 350 tons. These were dragged on 'sledges without rollers' from the quarries to the Nile river, were water-born 150 miles, and sledged from the river to the Temple of Karnak at Thebes.

The burden bearers of the centuries would gaze in amazement on man's fabulous development in his modes of transportation. The sledge has become the wheel — and the wheel, perfected with the use of the rubber tire, has conquered distance.

* * *

The rubber tire is one of man's most useful inventions. This product of the rubber industry is a marvel of strength and endurance. To the rubber tire the products of the carbon black industry have added long-wear and toughness. The carbon blacks of United Carbon Company, Inc., long have been important in the development of this constantly improved form of transportation.

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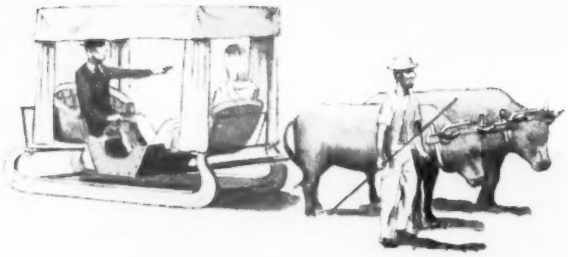

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Dixie 20, Semi-Reinforcing (SRF) furnace carbon black, boasts by far the widest applications in various types of rubbers, and is indispensable to ever so many compounders.

Dixie 20 is non-staining and is most uniform. It is characterized by high loading capacity; easy and smooth processing; softness; a good balance of tensile, modulus, and high resilience; low heat build-up; high resistance to flexing; and improved aging — all this plus low volume cost.

Dixie carbon blacks are in the front for unsurpassed performance. It is wise to standardize on United Carbon Blacks and stay in the lead.

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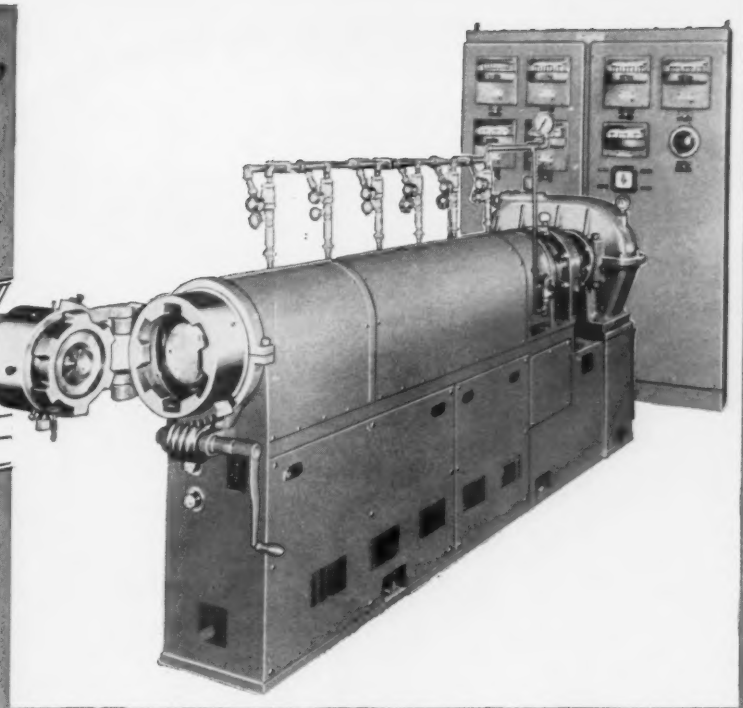

INDUCTION HEAT, with the Kullgren temperature control system, has these advantages: fast heat-up (to 400° in 20 minutes), low-cost operation at high temperatures, quick cooling, and "on-the-button" control.

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Aetna-Standard is currently delivering high pressure induction-heated extruders and dies. These machines are available in all standard sizes in addition to the well-known line of standard extruders.

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COMING

June 20. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 22-28. A.S.T.M. Annual Meeting, Hotel Statler, Boston, Mass.

June 27. Detroit Rubber & Plastics Group, Summer Outing, Western Golf and Country Club, Detroit, Mich.

June 27. Washington Rubber Group, Annual Outing.

July 25. Chicago Rubber Group, Golf Outing, Medinah Country Club, Medinah, Ill.

Aug. 5. New York Rubber Group, Golf Outing, Wingfoot Golf Club, Mamaroneck, N. Y.

Aug. 22. Philadelphia Rubber Group, Golf Outing. Manufacturers Golf & Country Club, Oreland, Penna.

Sept. 6. Connecticut Rubber Group, Summer Outing.

Sept. 10-12. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

Sept. 19. American Society for Quality Control, San Francisco Bay Area Quality Control Conference, Stanford, Calif.

Sept. 25. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Oct. 3. Detroit Rubber & Plastics Group, Fall Meeting, Detroit-Leland Hotel, Detroit, Mich.

Oct. 7. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

Oct. 9. Southern Ohio Rubber Group, Fall Technical Meeting, Gibbons Hotel, Dayton, Ohio.

Oct. 14. Buffalo Rubber Group, Hotel Westbrook, Buffalo, N. Y.

Oct. 16. Boston Rubber Group, Fall Meeting, Hotel Somerset, Boston, Mass.

Oct. 17. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Oct. 17-18. Southern Rubber Group, Roosevelt Hotel, New Orleans, La.

EVENTS

Oct. 24. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Oct. 24. Akron Rubber Group, Sheraton Hotel, Akron, Ohio.

Nov. 14. Connecticut Rubber Group.

Nov. 14. Philadelphia Rubber Group, Fall Dance, Manufacturers Golf & Country Club, Oreland, Penna.

Nov. 17-21. Society of the Plastics Industry Annual National Conference, Morrison Hotel, Chicago, Ill.

Nov. 30-Dec. 5. A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

Dec. 2. Buffalo Rubber Group, Xmas Party.

Dec. 4. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Dec. 12. Detroit Rubber & Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 12. New York Rubber Group, Xmas Party.

Dec. 13. Southern Ohio Rubber Group, Winter Meeting, Miami Valley Country Club, Dayton, Ohio.

Jan. 23, 1959. Akron Rubber Group, Sheraton Hotel, Akron, Ohio.

Jan. 30-31, 1959. Southern Rubber Group, Statler Hotel, Dallas, Texas.

Feb. 12, 1959. Fort Wayne Rubber & Plastics Group, Winter Meeting, Van Orman Hotel, Fort Wayne, Ind.

April 3, 1959. Akron Rubber Group, Sheraton Hotel, Akron, Ohio.

April 16, 1959. Fort Wayne Rubber & Plastics Group, Spring Meeting, Van Orman Hotel, Fort Wayne, Ind.

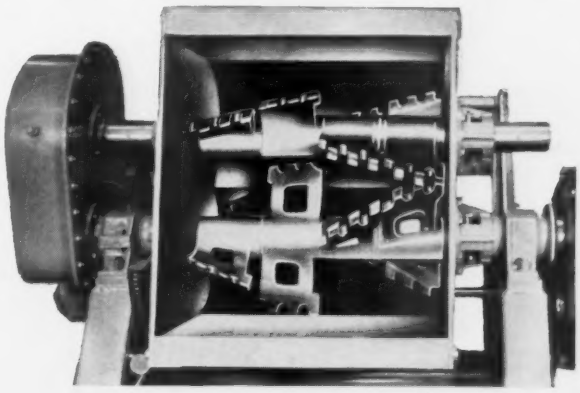
May 12-15, 1959. Division of Rubber Chemistry, A.C.S., Spring Meeting, Biltmore Hotel, Los Angeles, Calif.

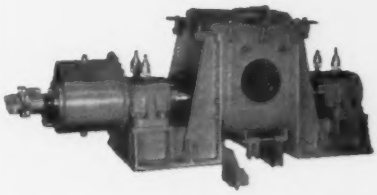
Nov. 9-13, 1959. Joint International Meeting of Division of Rubber Chemistry, A.C.S.; Committee D-11, A.S.T.M., and Rubber and Plastics Division, A.S.M.E., Shoreham Hotel, Washington, D. C.

May 24-27, 1960. Division of Rubber Chemistry, A.C.S., Spring Meeting, Statler Hotel, Buffalo, N. Y.

Sept. 13-16, 1960. Division of Rubber Chemistry, A.C.S., Fall Meeting, Commodore Hotel, New York, N. Y.

Why It's BRAMLEY-BEKEN *Today*





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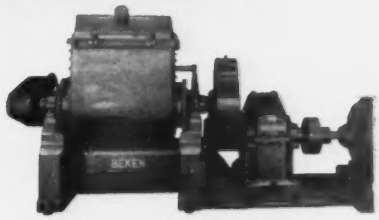

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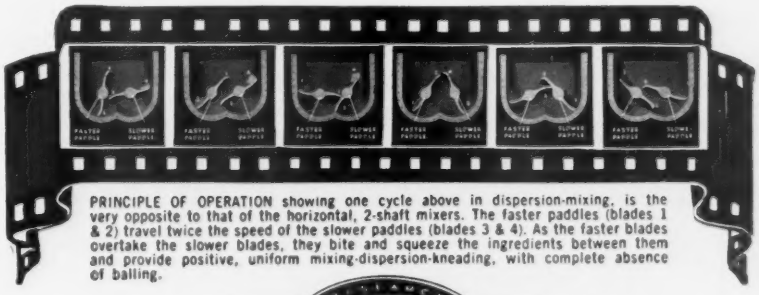
For Rubber Cement and Other Rubber Products

The Bramley-Beken cuts time tremendously! All power goes into productive work. Only that part of the mass being squeezed between the *multiple* paddle blades is worked on *at any one time.* Hence, saving in power per batch . . . increased productivity . . . less operating and maintenance costs . . . faster output . . . and a better end-product. The selection of the Bramley-Beken by America's top leaders has been the result. Laboratory and pilot test facilities are available.

How It Cuts 4-24 Hours to 1-4!



PRINCIPLE OF OPERATION showing one cycle above in dispersion-mixing, is the very opposite to that of the horizontal, 2-shaft mixers. The faster paddles (blades 1 & 2) travel twice the speed of the slower paddles (blades 3 & 4). As the faster blades overtake the slower blades, they bite and squeeze the ingredients between them and provide positive, uniform mixing-dispersion-kneading, with complete absence of balling.

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Neoprene Latex Type 673

An improved neoprene latex
for general adhesive applications

Neoprene Latex Type 673 offers three significant improvements for adhesive applications: rapid bond development, unusual hot bond strength, and high bond strength retention after the addition of tackifier resins. These properties make it extremely useful as a contact adhesive.

RAPID BOND DEVELOPMENT—Adhered wet and dried at room temperature, Neoprene Latex Type 673 developed cohesive peel strength almost twice as rapidly as other neoprene latices.

HOT BOND STRENGTH—Tested at 194° F. (90° C.) adhesive bonds made with Neoprene Latex Type 673 retained *five times* the bond strength of other neoprene latices.

BOND RETENTION—Type 673 compounds containing 50 parts of tackifier resins retained 30% more cohesive strength than other neoprene latices.

PHYSICAL PROPERTIES—Neoprene Latex Type 673 possesses the same good aging characteristics and resistance to oil and solvents typical of all neoprene latices. It offers good mechanical stability and is readily adapted to either manual or machine applications. It possesses outstanding compounding stability and is compatible with a wide range of materials. Cured or uncured, films of Type 673 crystallize rapidly at room temperature and are strong, tough and resilient. No fire, explosion or health hazards exist in its use. *Write for Report 58-5.*

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Neoprene Type FB

A fluid neoprene that can be cured even at room temperature

Neoprene Type FB is a low molecular weight polymer which becomes more fluid with increasing temperatures.

USES—The low viscosity of Neoprene Type FB makes it useful for such applications as sealants, caulking compounds, coatings, adhesives and as a binder for fibers and abrasives. In addition, Type FB can be used as a non-extractable vulcanizable plasticizer for other neoprenes, SBR and nitrile rubbers.

VULCANIZATE PROPERTIES—Neoprene Type FB vulcanizates possess essentially the same desirable properties common to other neoprenes. They are highly resistant to deterioration from oil, weather, sunlight and solvents.

Additional information on Neoprene Type FB is contained in Report 58-6. Copies can be obtained through the district office nearest you.

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How to strengthen the grip of a solvent-type adhesive

Have you been thinking of phenolic resins mainly as agents for compounding hard and semi-hard rubber stocks?

Then you may be overlooking one of phenolics' most interesting roles—as reinforcing agents in solvent-type adhesives.

You can produce excellent adhesives using Durez resins with nitrile rubber, natural rubber, and Neoprene. These resins have also been used successfully for bonding nitrile rubber stocks to metals.

Nitrile rubber solvent cements

You get strong bonds that become even stronger on aging, with Durez resins as modifiers in nitrile rubber cements.

Such adhesives have been used extensively by the shoe industry and are particularly well suited for applications involving the bonding of vinyls. They are also finding widespread use as general-purpose adhesives.

The resins are highly compatible with nitrile rubber. They are soluble in acetone and methyl ethyl ketone, the solvents normally employed in these cements. From 30 to 75 parts of resin are used per 100 parts of nitrile rubber, depending upon the degree of reinforcement, hardness, or flexibility required in the adhesive film.

For most applications, only room-temperature cures are necessary. However, when you need greater bonding strength and heat resistance, curing at 250°F or higher gives a noticeable improvement.

Nitrile rubber-to-metal bonds

You can greatly simplify the bonding of cured and uncured nitrile rubber compounds to most metals by using specific Durez resins.

Good adhesions are obtained to copper, brass, aluminum, tin plate, and regular and stainless steel. Medium good adhesions are obtained to zinc plate and galvanized steel.

Dissolved in recommended solvents, the resin is applied to the prepared metal surface and air dried to eliminate the solvent. In bonding uncured stocks, the bond is obtained during vulcanization of the compound.

Neoprene solvent cements

Neoprene cements modified with a Durez resin give good adhesion to a variety of surfaces including most metals, wood, leather, and Neoprene, and fair adhesion to natural rubber.

Neoprene Type AC is generally used. The optimum amount of resin to use for good adhesion to all surfaces is 100 to 125% on the weight of the Neoprene.

Natural rubber solvent cements

Still another Durez resin has been used extensively as a modifying ingredient for natural rubber solvent cements, particularly in adhesives used by the shoe industry.

This material is a tough, high-melting thermoplastic resin possessing heavy viscosity or body. It greatly reinforces the adhesive film and, without reducing adhesive properties, it decreases the tendency of such cements to string, thus resulting in a stronger bond immediately.

Because of its high melting point and heavy viscosity in the molten condition, this resin improves bond strength at elevated room temperatures.

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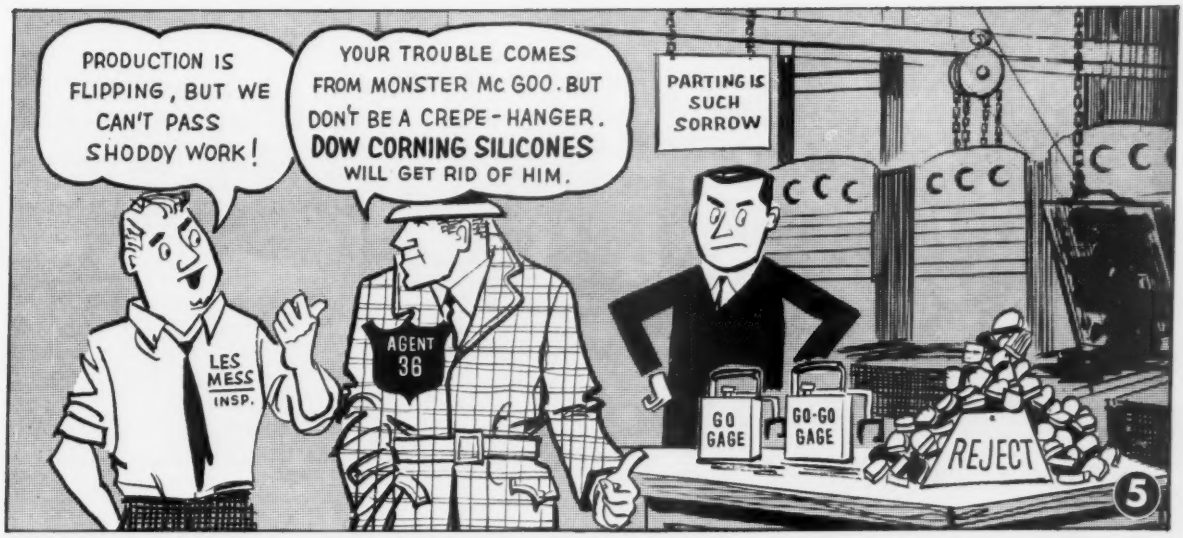
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YOUR TROUBLE COMES FROM MONSTER Mc GOO. BUT DON'T BE A CREPE-HANGER. DOW CORNING SILICONES WILL GET RID OF HIM.
PARTING IS SUCH SORROW
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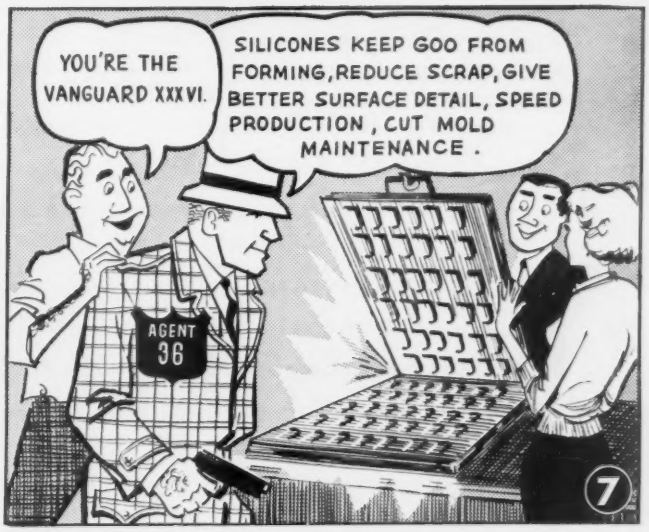
GO-GO GAGE
REJECT
5


YOU'RE THE VANGUARD XXXVI.
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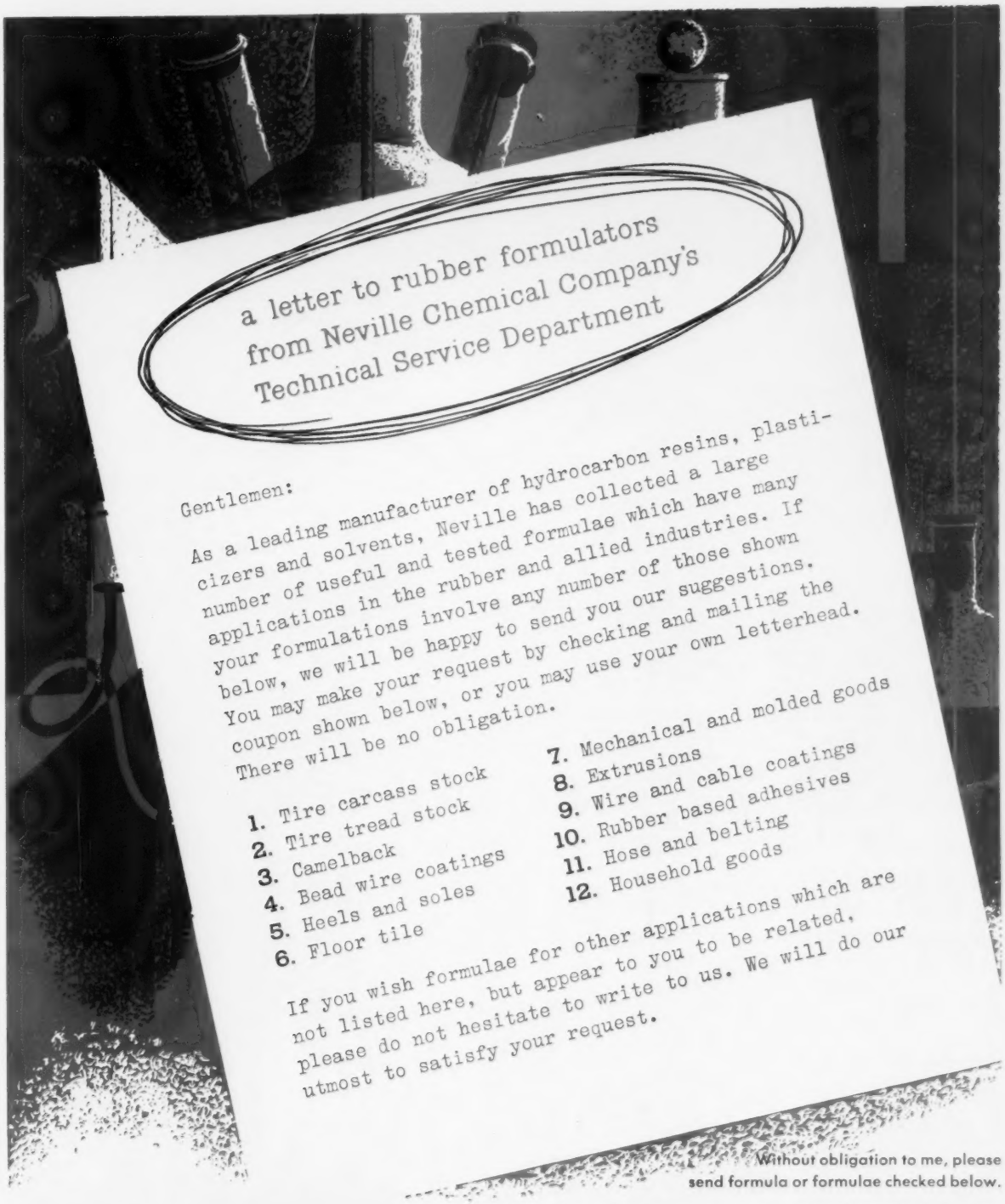
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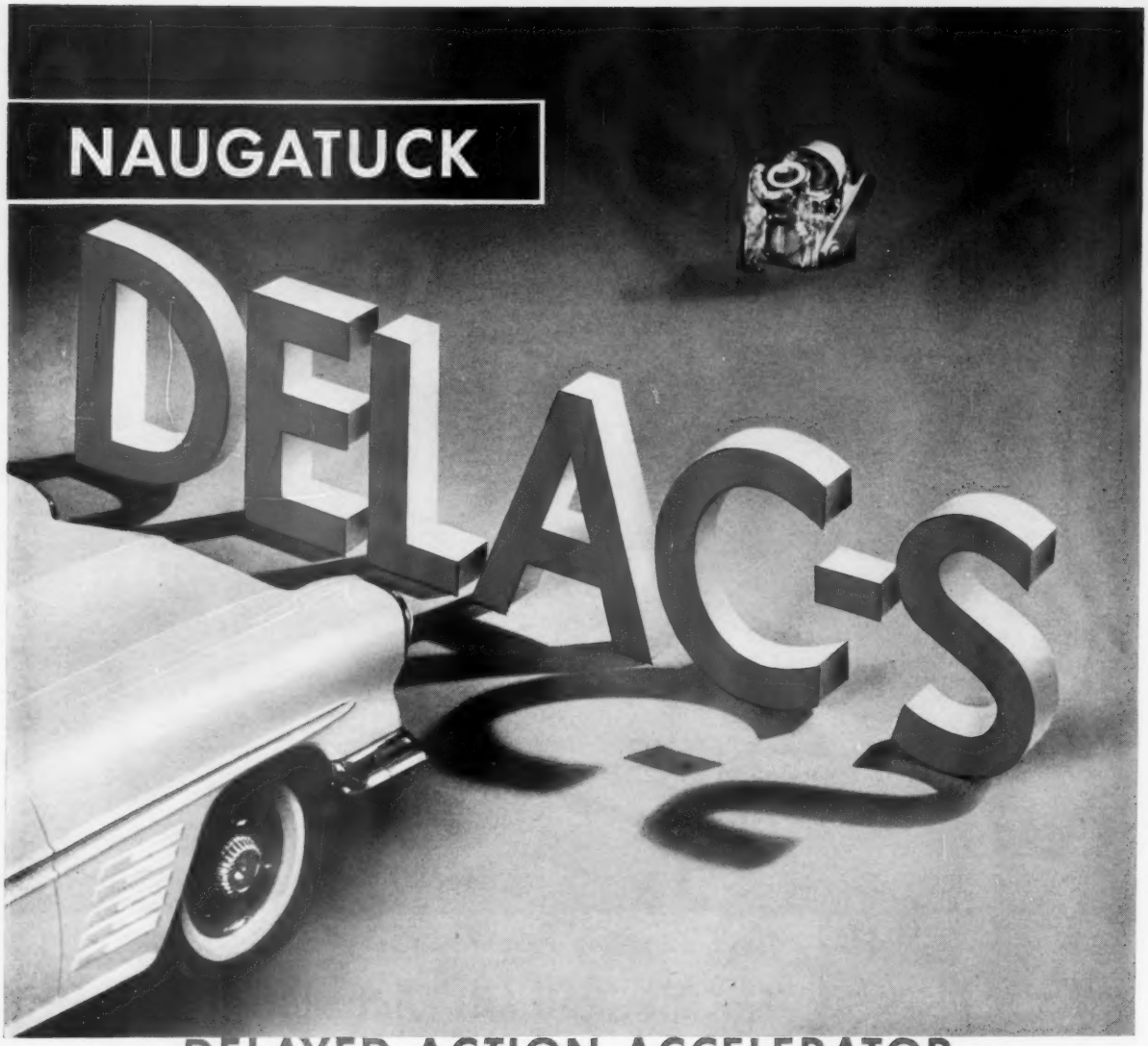

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Rubber Age

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A Simple Direct Method for

EXAMINING THE DISPERSION OF CARBON BLACK IN RUBBER

A practical approach to dispersion studies

A simple, practical and rapid method has been developed for examining the dispersion of carbon black in rubber. Briefly, the procedure is as follows: Approximately ten grams of unsheeted or uncalendered rubber from a batch mill are fully cured between smooth plates to approximately .010-inch gauge, then stretched by hand to about .005-inch gauge, taped tight over the bottom of a small container and viewed under a stereoscopic microscope at 20 magnifications, under illumination. A smooth, grain-free homogeneous surface is indicative of good dispersion, whereas an uneven and pimply or seedy surface is evidence of poor dispersion. Undispersed material in the form of lumps can be felt with a probing needle and dislodged.

Thus, there become available to manufacturers of masterbatches, tires and industrial rubber goods a simple control tool for the rapid examination of dispersion of carbon black or any other compounding ingredients. This tool makes it possible to study more readily the changes in dispersion brought about by revisions in formulation, cycle time of mixing, order of addition of ingredients, use of different Banburys, additional processing, and various sources of supply materials. It is particularly helpful in judging the homogenity of dispersion and surface condition of critical industrial rubber goods such as rollers, platens, and linings in certain types of hose.

By I. DROGIN

Vice President—Research, United Carbon Co., Inc., Charleston, West Virginia

HOW well compounding ingredients are dispersed in rubber is a matter of great importance because good dispersion has been regarded as essential in imparting better physical properties and greater resistance to tear and cracking. Poor dispersion, on the other hand, while helpful in attaining better electrical conductivity, is nevertheless associated with a lack of ultimate physical properties in the rubber, especially those of stress-strain. Poor dispersion may also account for variations in the properties of batch to batch and may be the cause for the unsatisfactory performance of a stock.

Some General Methods of Studying Dispersions

A number of methods for measuring the degree of dispersion have been described in the literature. Some of them are as follows: microscopic examination, electrical conductivity, level of reinforcement, streaking or

A microscopic examination of a rubber compound, crocking, X-ray and sheen.

according to Tidmus and Parkinson *(1)*, will give a knowledge of the dispersion of the ingredients in the rubber. The degree of dispersion can be determined by noting the number of different sizes of aggregates. Only those larger than about six microns are, according to Leigh-Dugmore *(2)*, counted. Thin sections (2 to 3 microns thick) of the compounded vulcanized stock are examined under a microscope at a magnification of about 70 to 100X using transmitted light. Thin sections of rubber to be thus examined are cut, while frozen, with a sledge microtome; or visual observation of the dispersion can also be made at very low magnification (3 to 5X) of freshly cut stock (unvulcanized, but preferably vulcanized); or cut sections may be examined with a microscope at about 330X using transmitted light *(3)*.

Information obtained from a surface examination is rather limited. More complete information concerning the interior of the compound is obtained when thin sec-

tions of the compounded stock are examined by transmitted light. Several methods for obtaining suitable sections may be used: (a) Cutting with a razor using an unmounted sample or a sample set in paraffin wax or cork, (b) cutting a thin section and stretching, or (c) squeezing a thin section between glass plates.

These methods are not quite satisfactory as it is rather difficult to obtain a sufficiently thin section and also because of the distortion produced. A more suitable way is to use a microtome.

Use of the Microscope

A practical example for determining the proportion of the filler which has been dispersed as aggregates smaller than some stated size has been cited by Smith *(4)*. The stock after being discharged from the Banbury is sheeted once through a laboratory mill set for 0.100 gauge. Thin slices of the stock are examined under the microscope at a magnification of 400X.

Undispersed black appears as opaque flake pigments or aggregates in contrast with comparatively transparent adjacent areas wherein the carbon black is well dispersed. The area of the undispersed carbon black is determined by projecting the microscopic image onto a calibrated area, and if the per cent carbon black in the sample as well as the specific gravity of the carbon black and of the stock is known, the per cent undispersed carbon black is readily calculated. The per cent undispersed carbon black is defined as that portion of the total carbon black in a given stock in the form of fragments measurable at a magnification of 400X.

Another method of surface examination, as described by Roninger *(5)*, is to vulcanize the rubber compound up to an ebonite and polish the surface. It was applied by Blow and Garner *(6)* to the examination of black dispersions in tread stocks. The sample is cut in the form of a small block (approximately 2 cm. x 1 cm. x 1 cm.) and cured in molten sulfur (140°C.) for about 18 hours, and then polished on emery paper, slate stone, magnesium oxide paste and felt pad.

The adequacy of a dispersion, according to Ladd and Ladd *(7)*, can also be assessed by observing directly the number of aggregates of different sizes with the electron microscope, but the procedure is rather too unwieldy for regular use. The techniques used in obtaining very thin sections of carbon black rubber stock for the examination for degree of dispersion in the electron microscope are as follows:

Vulcanized film. The technique consists of squeezing uncured stock into thin films in special molds and then curing the film.

Microtome. The use of a high speed microtome where by changing from a knife mounted radially in the centrifuge head to a knife mounted with cutting edge at an angle of about 60° to the radius, an improvement of both quality and quantity of the usable sections cut will be obtained.

Spreading. First the specimens are generally obtained as a jelly-like mass suspended in benzene. The microscope slide is dipped into a 0.5% solution of Formvar (polyvinyl methylal) in ethylene dichloride and then allowed to dry. A piece of the carbon gel is removed from the benzene, placed on the Formvar and then spread thinly on the film by strokes of a spatula. The Formvar film is then floated off on a water surface and transferred to 200 mesh screens ready for the electron microscope investigation.

Shadow castings. The coating of the carbon gel with a thin layer of chromium has helped the interpretation of carbon gel pictures. The 200-mesh screen supporting the Formvar film with "spread" gel is placed in a vacuum chamber and coated with vaporized chromium applied in such a manner as to cast shadows of the gel on the Formvar film.

Freezing. The sample is frozen to the desired hardness with dry ice in a special sample holder freezing chamber and sections approximately 0.05 micron thick are cut with a rotary microtome having a special felt *(8)*.

It is to be noted that microscopic examination of rubber compounds requires technique in preparing the specimens and the necessary experience to properly interpret the facts observed. It may be advisable to first examine the surface of the sample by reflected light. This is the best method for a preliminary investigation because of the simplicity of the preparation of the specimen. It offers the advantage that a large field is examined, thus providing a more general view of the surface. It can also give information concerning the physical structure of vulcanizates, showing up irregularities resulting from an uneven working or vulcanizing, as well as the calender grain, extrusion grain and laminations best seen by this lighting.

The degree of dispersion can be established also by electrical conductivity measurements wherein the lower the conductivity, the poorer the dispersion *(3)*; or by extruding the final stock through a Garvey die and making a visual examination of the extruded stock at low magnification; or by the reinforcement properties whereby under like conditions of compounding the one with the better rubber physicals is considered to be the best dispersed; or by noting the marking tendency; or streaking or crocking (the appearance of splotches) on the surface of the rubber, the fewer the markings the better the dispersion; or by the sheen of the stock, a darker sheen reflecting better dispersion; and, finally, by X-rays *(9, 10)*.

New Test Method

The author has developed a simple, practical and rapid method for examining the dispersion of compounding ingredients in rubber. It does not require any elaborate technique in the preparation of sample specimens nor any experience in the interpretation of results. The degree and character of dispersion can be readily observed under the microscope at low magnification. It is especially useful in studying dispersion in neoprene and butyl rubber and particularly in nitrile rubber, in which it is rather difficult to disperse material.

The author has applied this method in an extensive study of the dispersion of carbon blacks in various rubbers and under different mixing cycles. The rubber goods manufacturing plants where this method has been demonstrated have recognized it as a rapid means of gauging the quality of their products from the viewpoint of dispersion.

The necessary equipment is as follows:

(1) Two metal plates about 10 x 14 inches, with smooth shiny polished surfaces. Mirror-finished chrome

ferrotype plates of the proper size are ideal for this purpose. They are used for drying photographic prints and are obtainable at any photographic supply house at a very nominal cost. They give a nice glossy smooth finish to the rubber. Stainless steel or aluminum plates are unsatisfactory as they tend to leave striations in the surface of the rubber.

(2) A stereoscopic binocular microscope having a total magnification of 10 and 20 diameters (Bausch and Lomb Optical Co., Rochester 2, N. Y., Catalog No. 31-26-10-63, Model JK-2, List Price $333).

(3) An illuminator such as the Nicholas Illuminator (Bausch and Lomb Optical Co., Catalog No. 31-33-51-01, List Price $46), which has a 6.5-v, 25.5 c.p. bulb for 115-v, AC, a focusable condenser and a blue glass filter. A less expensive illuminator or a photo flood light can be used, but these tend to heat up and they are not as flexible in sharp focusing of the light on the rubber.

(4) An adjustable transformer for use with the Nicholas Illuminator (Bausch and Lomb Optical Co., Catalog No. 31-36-45, List Price $18).

(5) An open metal container from 1 to 2¾ inches in diameter. An ointment container is suitable for this purpose. The larger size container naturally provides more surface for examination.

(6) Scotch tape, which is required for taping the stretched rubber to the sides of the container.

(7) A dissecting or probing needle for feeling and dislodging the undispersed material.

(8) A wax pencil for marking the inside of the container for identifying the rubber.

Test Procedure

Step 1. Approximately a ten gram portion of unsheeted or uncalendered rubber from a batch mill (thickness is immaterial) is placed in the center of a ferrotype plate (Figure 1).

Step 2. This plate is covered somewhat obliquely with another ferrotype plate (Figure 2). This placement makes it easy to pry the two plates apart after they are removed from the press, and thus avoid bending the corners.

Step 3. If ferrotype plates are used, it is advisable to back them (sandwich type) between two heavier plates (Figure 3) so as to prevent their being dented because of pits and irregularities in the surface of the platens.

Step 4. The rubber is cured for about as long a time as is normally used in curing a hardness or specific gravity button. It should not be assumed that because the rubber is thin it will require much less curing time. An undercure should be avoided because it tends to exaggerate any poor dispersion. The undercured rubber is also too stretchy and it becomes more difficult to remove any undispersed material by means of the probe. The usual steam pressure normally available for the press will suffice for the cure.

The objective is to obtain a cured fairly thin sheet of rubber (Figure 4). For good results, the thickness of the cured thin rubber should not exceed .013-inch gauge and may be as thin as .008-inch. Thinness is desirable because the rubber can be stretched by hand more easily. Furthermore, the undispersed material is more readily revealed in a thin sheet and is also more readily dislodged.

Step 5. After the plates are removed from the press, the cured thin rubber sheet is carefully stripped from the plate (Figure 5) and not allowed to curl, otherwise it will stick to itself. For easier handling, the rubber sheet should be cut in half.

Step 6. Select a suitable container (Figure 6).

Step 7. Mount the container on any object, viz., a bottle or similar object (Figure 7) that will fit it and thus provide sufficient leverage when taping the stretched rubber to the sides of the container.

Step 8. The cured thin sheet of rubber is stretched by hand (Figure 8) as much as possible to reduce it to about .005-inch gauge.

Step 9. The stretched rubber is placed taut over the bottom of the mounted container and the overhanging rubber held flush to the sides of the container (Figure 9).

Steps 10 and 11. While in this positon, the stretched rubber is taped to the sides of the container (Figure 10). Once around with the tape is sufficient. The rubber sample is identified by a suitable mark inside the container. The finished mounted sample is shown in Figure 11.

Step 12. The container with the mounted thin rubber is next positioned under a microscope and the illuminator light focused on the surface of the rubber (Figure 12).

Studying the Dispersion

The dispersion is best studied under a stereoscopic microscope (Figure 13) at 20 magnification. The container is moved in different positions until the entire surface has been examined. It is very important that the spot viewed be fully illuminated as only then will any irregularities and undispersed material be in sharp contrast. Otherwise, they are apt to be overlooked if the light is not fully concentrated on them.

Rotating the container under the strong light will soon reveal any irregularities. A smooth, grain-free surface is indicative of good dispersion, whereas an uneven and pimply or seedy surface is the result of poor dispersion. Lumps and irregularities in the surface of the rubber can be felt with a probing needle, their hardness easily detected, and the undispersed material dislodged. The undispersed material can then be identified as to whether it is undispersed polymer or an undispersed compounding ingredient, such as zinc oxide, antioxidant, stearic acid, accelerator or carbon black. The presence of undispersed oil may be detected by the multicolor effect when the light strikes the surface of the rubber. It is not always possible to achieve the best dispersion. Nevertheless, a standard can be established for reference.

One precaution should be taken. The rubber (uncured or cured) should not be placed on Holland cloth, as the starch from the latter will cling to the rubber and mar its surface; nor should uncured rubber with any chalk mark be used, as the chalk will appear on the surface of the cured thin sheet.

If desired, a photograph can be taken of the dispersion in the rubber (Figure 14). The technique, as suggested by Meyers *(11)*, for taking photographs through the microscope is fairly simple. It is only necessary to have the film plane of the camera perpendicular to the light rays coming from the microscope and also have the correct exposure for the type of film being used.

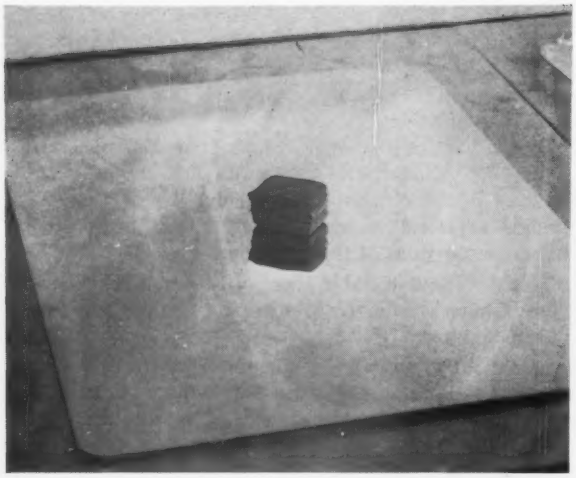

FIG. 1—A portion of about 10 grams of unsheeted or uncalendered rubber from a batch mill is placed in the center of a ferrotype plate.

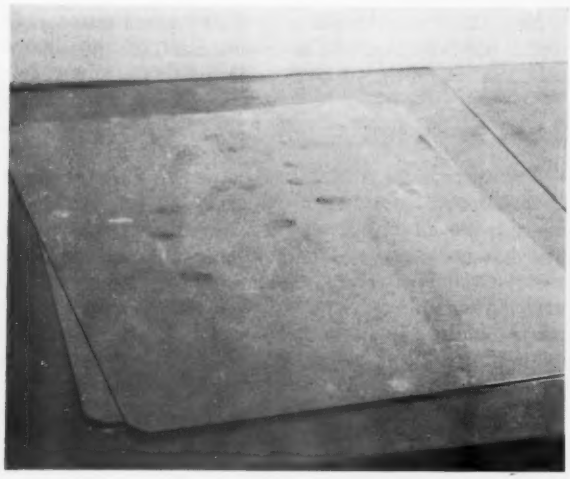

FIG. 2—The plate in Figure 1 is covered somewhat obliquely with another ferrotype plate. This placement makes separation easier.

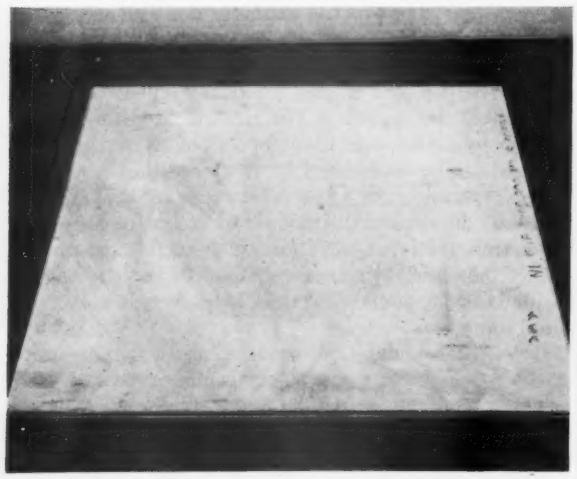

FIG. 3—The two ferrotype plates are then sandwiched between two heavier cover plates which provide a safeguard against indentations.

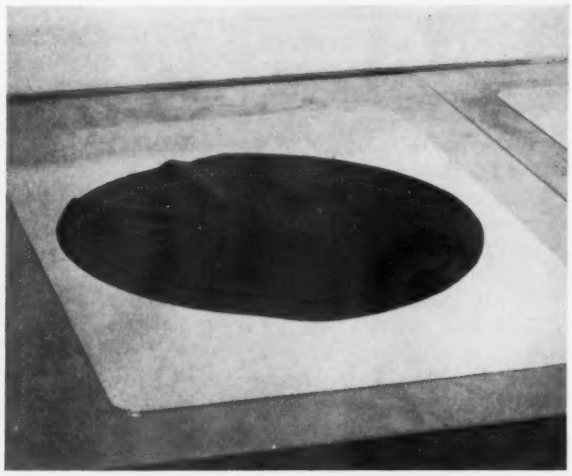

FIG. 4—The rubber, in the form of a thin sheet, is fully cured. The thickness of the sheet should be in the .008-.013 inch range.

FIG. 5—After the plates are removed from the press, the cured thin sheet is carefully stripped from the plate but not allowed to curl.

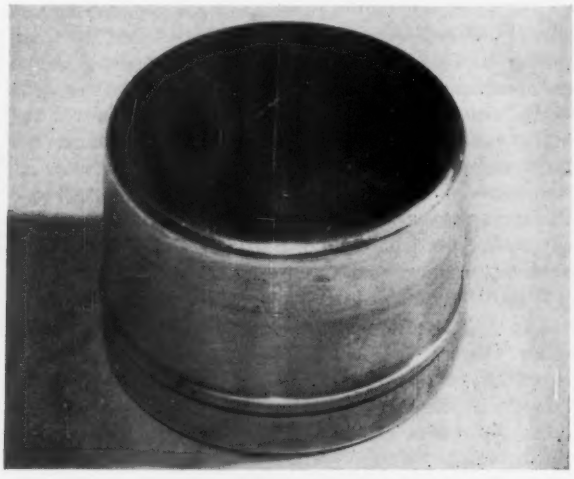

FIG. 6—As the next step, a container suitable for use in the procedure, like the one used for ointment seen above, is selected.

FIG. 7—The container is mounted on an improvised mandrel, such as a bottle, to provide sufficient leverage when taping the rubber.

FIG. 10—After being positioned as described in Figure 9, the stretched rubber sheet is next taped to the sides of the container.

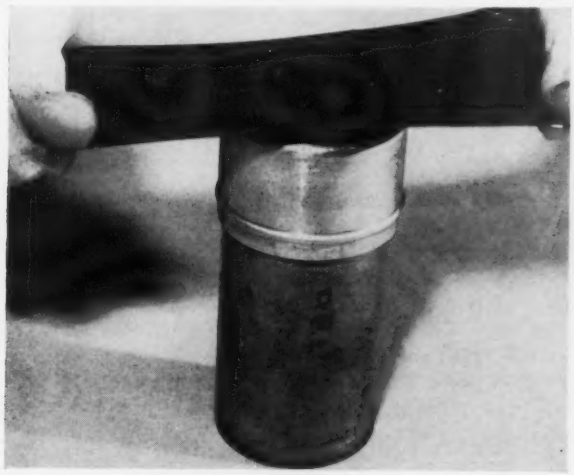

FIG. 8—The cured thin sheet of rubber is then stretched by hand as much as possible in order to reduce it to about .005-inch gauge.

FIG. 11—The finished mounted sample. The rubber specimen is identified by a suitable mark which is placed inside the container.

FIG. 9—The stretched rubber is placed taut over the bottom of the mounted container and the overhanging edges held flush to the sides.

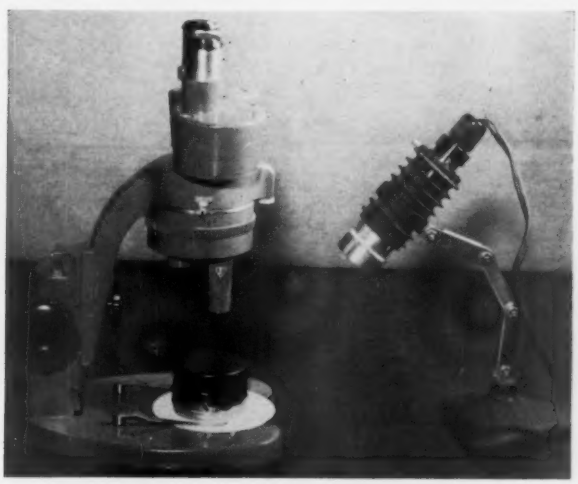

FIG. 12—The container with the mounted sample is next positioned under a microscope and the illuminator light focused on the surface.

FIG. 13—A stereoscopic microscope (such as this Bausch & Lomb instrument, Model JK-2) is best for studying the dispersion sample.

The best type of camera suitable for this purpose is a single lens reflex with a focal plane shutter. The 35 mm single lens reflex camera is small enough and it can readily be adapted to microscope work by attaching it firmly to the occular piece by an extension tube. Any type camera can also be used for this purpose provided it is firmly held over the microscope. For that matter, a 4 x 5 press-type camera with a ground glass back may also be utilized by simply varying the extension of the bellows, provided the object being photographed is illuminated sufficiently.

The following are suggested exposures and films for 35 mm and 2¼-inch square cameras with 300 watt illumination, approximately 18 inches from the microscope stage:

COLOR	
Kodachrome	1 to 3 mins.
Anscochrome—Ektachrome	30 secs.
Super Anscochrome	5 to 15 secs.
BLACK AND WHITE	
Panatomic X	30 secs.
Plus X—Verichrome Pan	5 to 15 secs.

Experimental Data

Dispersion studies were made of laboratory mixed tire tread stocks based on butadiene-styrene (41°F.) rubber, oil-extended butadiene-styrene rubber (37½ parts), and natural rubber, each compounded with SAF, ISAF, HAF, and EPC blacks, respectively, at 50 parts loading per 100 parts of rubber. A two stage mix was used. The

TABLE I—TIRE TREAD FORMULATIONS

Carbon Black	Kosmos 85/Dixie 85 (SAF) / Kosmos 70/Dixie 70 (ISAF) / Kosmos 60/Dixie 60 (HAF)	Kosmobile 77/ Dixiedensed 77 (EPC)
Butadiene-Styrene Rubber (41°F.)		
Philprene 1500	100.00	100.00
Carbon Black	50.00	50.00
Zinc Oxide	5.00	5.00
Stearic Acid	2.00	2.00
BLE	1.50	1.50
Circosol 2XH	6.00	6.00
Santocure	1.00	1.20
Sulfur	1.75	2.20
Total	167.25	167.90
Oil-Extended Butadiene-Styrene Rubber (37½ PHR)		
Philprene 1712	137.50	137.50
Carbon Black	68.75	68.75
Zinc Oxide	5.00	5.00
Stearic Acid	2.00	2.00
BLE	1.50	1.50
Circosol 2XH	6.00	6.00
Santocure	1.00	1.20
Sulfur	1.75	2.20
Total	223.50	224.15
Natural Rubber		
Natural Rubber	100.00	100.00
Carbon Black	50.00	50.00
Zinc Oxide	5.00	5.00
Stearic Acid	2.00	2.00
BLE	1.50	1.50
Circosol 2XH	6.00	6.00
Santocure	0.40	0.60
Sulfur	2.60	2.80
Total	167.50	167.90

TABLE II—BANBURY MIXING CYCLES

MASTERBATCH

Cycle Time—2½ Minutes

Minutes	
0	Load Rubber + Zinc Oxide + Stearic Acid + Antioxidant + Black
1¾	Add Oil
2½	Discharge

Cycle Time—3½ Minutes

0	Load Rubber + Zinc Oxide + Stearic Acid + Antioxidant + Black
2¾	Add Oil
3½	Discharge

Cycle Time—4½ Minutes

0	Load Rubber + Zinc Oxide + Stearic Acid + Antioxidant + Black
3¾	Add Oil
4½	Discharge

Cycle Time—5½ Minutes

0	Load Rubber + Zinc Oxide + Stearic Acid + Antioxidant + Black
4¾	Add Oil
5½	Discharge

FINAL

Cycle Time—2 Minutes

0	Add Masterbatch
½	Add Curatives
2	Discharge

Laboratory Banbury, Size B, operated at speed No. 2 (116 rpm) for Masterbatch, and at slow speed (55 rpm) for Final.

TABLE III—PROPERTIES OF CARBON BLACKS

Type	Black	Basic Fuel	Surface Area (Sq.M./Gm.)	Particle Diameter μ	Volatile Matter (%)	Ash (%)	pH	Benzol Extract (%)	Nigrometer Index	Oil Absorption (cc./100 Gm. Black)	Iodine Adsorption (%)
SAF	Kosmos 85/Dixie 85	Oil	127.2	24.6	1.92	0.27	9.6	0.17	86.1	152	16.3
ISAF	Kosmos 70/Dixie 70	Oil	101.8	30.7	1.45	0.78	9.1	0.11	90.0	143	13.2
HAF	Kosmos 60/Dixie 60	Oil	69.2	45.2	1.63	0.24	9.2	0.05	93.9	126	9.8
EPC	Kosmobile 77/Dixiedensed 77	Gas	109.7	28.3	5.70	0.05	4.3	0.03	85.4	112	15.6

masterbatches were prepared in a laboratory Banbury, size B, for 2½, 3½, 4½ and 5½ minutes respectively. The increased time was devoted exclusively to the mixing in of the black. A fixed period of ¾-minute was given to the mixing in of the oil. All the finals were prepared in the Banbury in 2 minutes.

The formulations, identical for all the rubbers and the blacks, are shown in Table I, the mixing cycles in Table II, the physical and chemical properties of the carbon blacks in Table III, the rating of the dispersion in the three rubbers at different mixing cycles in Table IV, the rating of the dispersion of the carbon blacks at different mixing cycles in Table V, and a comparison of the dispersion of each black in each rubber for the short (2½ minute) and long (5½ minute) mixing cycles in Table VI.

The studies produced the following results:

Butadiene-Styrene Rubber (41°F.). HAF and ISAF show the best dispersion and EPC shows the poorest. SAF shows better dispersion when the mixing cycle is short (2½ minutes) and poorer dispersion when the mixing cycle is extended to 5½ minutes.

Oil-Extended Butadiene-Styrene Rubber (37½ Parts). EPC again shows the poorest dispersion whereas HAF shows the best, followed by ISAF and then by SAF.

Natural Rubber. ISAF shows the best dispersion. EPC shows the poorest dispersion when the mixing cycle is relatively short (2½ minutes). However, its dispersion is improved somewhat as the mixing cycle is extended to 5½ minutes. The reverse holds true for SAF. It shows relatively good dispersion when the mixing cycle is short (2½ minutes). However, the dispersion becomes poorer as the mixing cycle is increased to 5½ minutes.

Carbon Blacks. It is obvious that in a very short mixing cycle of 2½ minutes, SAF shows best dispersion in natural rubber and poorest in butadiene-styrene rubber (41°F.). As the mixing cycle is extended to 5½ minutes, best dispersion is obtained in butadiene-styrene rubber and the poorest in the oil-extended rubber.

The dispersion of ISAF is best in natural rubber and poorest in butadiene-styrene rubber when the mixing cycle is short (2½ minutes). However, when the mixing time is extended to 5½ minutes, best dispersion of the black is obtained in the oil-extended rubber and the poorest in the non oil-extended rubber.

The best dispersion of HAF is obtained in oil-extended rubber and the poorest in the non oil-extended rubber when the mixing cycle is relatively short (2½ minutes), but when the cycle is extended to 5½ minutes, best dispersion is obtained in natural rubber and poorest in non oil-extended rubber.

The best dispersion of EPC is obtained in natural rubber and the poorest in oil-extended rubber.

Mixing Cycle Time. In the laboratory, better dispersion of SAF and HAF is achieved in butadiene-styrene rubber (41°F.), oil-extended rubber (37½ parts), and natural rubber when their mixing time is short (2½ minutes), and poorer dispersion will result when their mixing time is relatively long (5½ minutes). The reverse holds true in the case of ISAF and EPC. These blacks require a longer mixing time of the masterbatch to achieve better dispersion.

It is quite obvious that the mixing time of the masterbatch is a governing factor in dispersion and that in the case of laboratory mixed stocks, extending the mixing time may well influence the dispersion. Under these circumstances, it is advisable to effectively control the mixing time of the masterbatch to establish a desired dispersion.

Blackness or Sheen of Mixed Cured Stock. Based on blackness of the mixed stocks, it is evident from the darker appearance of the cured rubber that in the case of SAF, ISAF, and HAF blacks, under like mixing cycle time, these are better dispersed in butadiene-styrene rubber (41°F.) than in natural rubber, and better dispersed in natural rubber than in oil-extended rubber. Similarly, in the case of EPC black, under like mixing cycle time, it is better dispersed in natural rubber than in butadiene-

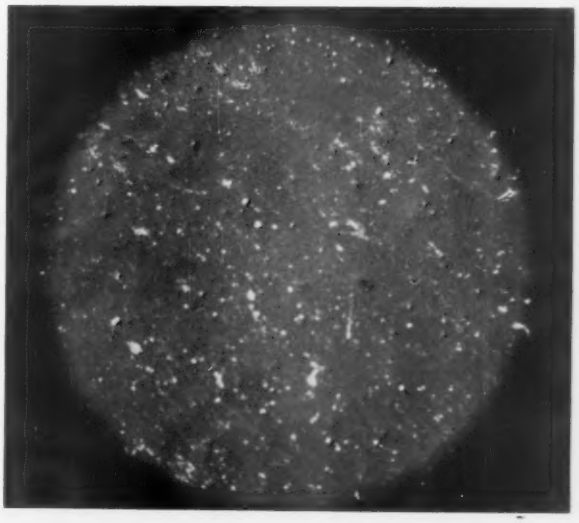

FIG. 14—Photomicrograph of a typical dispersion (20X) taken by the Meyers procedure provides a permanent record of a test sample.

TABLE IV—RATING OF DISPERSION IN RUBBERS USING DIFFERENT MIXING CYCLE TIMES FOR THE MASTERBATCHES

	Masterbatch Mixing Cycle Time (Minutes) 2.5					Masterbatch Mixing Cycle Time (Minutes) 3.5					Masterbatch Mixing Cycle Time (Minutes) 4.5					Masterbatch Mixing Cycle Time (Minutes) 5.5				
			Temp. (°F.) of Masterbatch in Banbury					Temp. (°F.) of Masterbatch in Banbury					Temp. (°F.) of Masterbatch in Banbury					Temp. (°F.) of Masterbatch in Banbury		
Dispersion	Type Black	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)	Type Black	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)	Type Black	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)	Type Black	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)
									Butadiene-Styrene Rubber (41°F.)											
Best	HAF	60	273	240	445	ISAF	62	296	267	720	HAF	58	291	260	770	ISAF	62	312	274	945
	SAF	73	274	245	520	SAF	70	278	264	675	ISAF	64	300	278	815	HAF	57	302	272	945
	ISAF	64	278	256	500	HAF	59	284	260	630	SAF	68	294	260	845	SAF	68	297	273	1010
Poorest	EPC	63	255	232	430	EPC	62	270	248	590	EPC	60	280	258	780	EPC	59	288	260	900
									Oil Extended Butadiene-Styrene Rubber (37½ phr)											
Best	HAF	57	268	268	420	ISAF	60	288	272	600	HAF	54	272	252	705	HAF	51	272	244	810
	ISAF	63	268	263	445	HAF	55	275	256	580	ISAF	58	282	256	730	ISAF	56	282	282	860
	SAF	69	252	260	440	SAF	66	287	272	620	SAF	65	286	265	765	SAF	65	288	266	930
Poorest	EPC	57	238	240	390	EPC	57	263	254	540	EPC	54	266	252	690	EPC	52	269	251	810
									Natural Rubber											
Best	ISAF	73	245	236	420	ISAF	67	274	256	630	ISAF	66	287	260	740	HAF	60	276	248	865
	SAF	81	225	213	400	SAF	77	242	230	570	HAF	61	275	250	730	ISAF	65	288	255	890
	HAF	66	236	229	410	HAF	64	260	238	575	EPC	60	243	229	630	EPC	62	246	234	675
Poorest	EPC	62	222	220	380	EPC	61	242	230	540	SAF	82	262	240	715	SAF	71	267	256	875

TABLE V—RATING OF DISPERSION OF CARBON BLACKS USING DIFFERENT MIXING CYCLE TIMES FOR THE MASTERBATCHES

	Masterbatch Mixing Cycle Time (Minutes) 2.5					Masterbatch Mixing Cycle Time (Minutes) 3.5					Masterbatch Mixing Cycle Time (Minutes) 4.5					Masterbatch Mixing Cycle Time (Minutes) 5.5				
			Temp. (°F.) of Masterbatch in Banbury					Temp. (°F.) of Masterbatch in Banbury					Temp. (°F.) of Masterbatch in Banbury					Temp. (°F.) of Masterbatch in Banbury		
Dispersion	Type Rubber	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)	Type Rubber	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)	Type Rubber	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)	Type Rubber	Compounded Mooney Viscosity	Before Adding Oil	At Discharge	Power Consumption (Watt-Hrs.)
									Super Abrasion Furnace (SAF)											
Best	Nat.	81	225	213	400	LTP	70	278	264	675	OEP	65	286	265	765	LTP	68	297	273	1010
	OEP	69	252	260	440	Nat.	77	242	230	570	Nat.	82	262	240	715	Nat.	71	267	256	875
Poorest	LTP	73	274	245	520	OEP	66	287	272	620	LTP	68	294	260	845	OEP	65	288	266	930
									Intermediate Super Abrasion Furnace (ISAF)											
Best	Nat.	73	245	236	420	LTP	62	296	267	720	Nat.	66	287	260	740	OEP	56	282	282	860
	OEP	63	268	263	445	Nat.	67	274	256	630	OEP	58	282	256	730	Nat.	65	288	255	890
Poorest	LTP	64	278	256	500	OEP	60	288	272	600	LTP	64	300	278	815	LTP	62	312	274	945
									High Abrasion Furnace (HAF)											
Best	OEP	57	268	268	420	OEP	55	275	256	580	Nat.	61	275	250	730	Nat.	60	276	248	865
	Nat.	66	236	229	410	LTP	59	284	260	630	OEP	54	272	252	705	OEP	51	272	244	810
Poorest	LTP	60	273	240	445	Nat.	64	260	238	575	LTP	58	291	260	770	LTP	57	302	272	945
									Easy Processing Channel (EPC)											
Best	Nat.	62	222	220	380	Nat.	61	242	230	540	Nat.	60	243	229	630	Nat.	62	246	234	675
	LTP	63	255	232	430	LTP	62	270	248	590	LTP	60	280	258	780	LTP	59	288	260	900
Poorest	OEP	57	238	240	390	OEP	57	263	254	540	OEP	54	266	252	690	OEP	52	269	251	810

styrene rubber (41°F.) or in oil-extended rubber, and better dispersed in oil-extended rubber than in butadiene-styrene rubber (41°F.).

Miscellaneous Data

The author has demonstrated that in a laboratory Banbury mix, poorer dispersion results when the oil is added in advance of the carbon black. Likewise, any oil scraped off the Banbury rotor blades and then smeared on the batch on the sheeting mill will also be poorly dispersed. Better dispersion is obtained when the stock temperature in the Banbury is 350°F. mixed at 90 rpm, dump time of 3 minutes, as compared with the mix where the temperature was deliberately kept low, viz., 280°F. mixed at 60 rpm, dump time of 2 minutes.

The author has also had the opportunity of visiting a number of tire and industrial rubber goods manufacturing plants and examining the dispersion of some of their mixed stocks. While there he demonstrated the following interesting points with reference to dispersion: (1) a reduction in Banbury mixing time without increasing ram pressure or rotor speed definitely results in poorer dispersion; (2) the stock at the feed mill shows better dispersion than the same rubber taken off a skid on the mill room floor; (3) natural rubber shows better dispersion than butadiene-styrene rubber (41°F.); (4) neoprene rubber stock from the Banbury shows poorer dispersion in comparison with the same stock that had subsequently been put through an extruder and later processed on a mill, and (5) the dispersion of stocks containing reclaim is not too good.

ACKNOWLEDGMENT

The author gratefully acknowledges the help received from S. Trail, F. R. Lorentz, J. M. Knight, L. Crosby, A. Childs and C. W. Snow in the Charleston, West Virginia, laboratory of United Carbon Co., Inc., and from H. R. Bishop and his staff in the Borger, Texas, laboratory of the United Carbon Co., Inc. Thanks are also due to Mary A. Watring and Lenora H. Legg for the tabulation and typing of the data; to M. George for the Xerox work (multiple copies); to S. H. Benton of Charleston, West Virginia, for the photographs; to Bausch and Lomb Optical Company, Rochester, New York, for their photograph of the Stereoscopic microscope; to the management of United Carbon Company, Inc., for permission to publish this paper; and to many friends in the rubber industry who furnished samples of factory mixed stocks for dispersion examination.

TABLE VI—COMPARISON OF DISPERSION IN VARIOUS RUBBERS WITH VARIOUS BLACKS AT SHORT AND LONG MIXING CYCLES OF THE MASTERBATCHES

Rubber	LTP	OEP	Natural
Super Abrasion Furnace (SAF)			
Best	2.5 Mins.	2.5 Mins.	2.5 Mins.
Poorest	5.5 Mins.	5.5 Mins.	5.5 Mins.
Intermediate Super Abrasion Furnace (ISAF)			
Best	5.5 Mins.	5.5 Mins.	5.5 Mins.
Poorest	2.5 Mins.	2.5 Mins.	2.5 Mins.
High Abrasion Furnace (HAF)			
Best	2.5 Mins.	2.5 Mins.	2.5 Mins.
Poorest	5.5 Mins.	5.5 Mins.	5.5 Mins.
Easy Processing Channel (EPC)			
Best	5.5 Mins.	5.5 Mins.	5.5 Mins.
Poorest	2.5 Mins.	2.5 Mins.	2.5 Mins.

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Additional Report of an Avoidable Accident

A REPORT of an avoidable accident in a rubber manufacturing plant which appeared recently in *Safety News Letter*, published by the Rubber Section of the National Safety Council, concerned the use of fork trucks. An employee had been operating a fork truck all morning. After lunch he took a similar truck, and in lowering a load, reached for what he thought was the proper control. Instead, the lever tilted the mast forward, causing the rear end of the truck to raise off the floor and whip to the side. He was thrown from the truck and suffered severe lacerations. Investigation, after the accident, revealed that the controls on the second truck were exactly the reverse of those on the truck used during the morning.

Corrective measures involved a survey of all equipment of this type throughout the plant. Controls were found to be uniform with the exception of the one truck used during the morning. Since it was not practical to change the position of the controls, this unit was taken out of service.

Elastomers for Use in Radiation Fields

Part IV: Effects of Gamma Radiation on Miscellaneous Elastomers and Rubberlike Plastics Materials

Butyl rubber

Natural rubber

Polysulfide rubber

Vinylpyridine rubber

Polyethylene

Polyvinyl chloride

Supplemental elastomers

By ROBERT HARRINGTON

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THE previous articles *(1, 2, 3)* in this series have presented background information on the subject of radiation damage to organic polymers, outlined the method of measuring physical property changes, presented some sections concerning some basic considerations, and have shown how gamma radiation affects the physical properties of many classes of elastomers as well as materials within a class.

This article continues the presentation of data on elastomers classed as miscellaneous as they could not conveniently be grouped with the others in the preceding articles. Also included are data on a few rubberlike plastics materials whose properties are somewhat similar to those of the elastomers. In addition, data are presented on elastomers belonging to groups in the other articles which were obtained too late for inclusion in those articles.

As most of the basic types of available elastomers will have been analyzed with the publication of this article, a general discussion comparing radiation effects in these chemically different materials will be included here. Future articles will be primarily concerned with more specific effects or basic considerations, as well as the effects of radiation in combination with other environments. Engineering data will be included from time to time on new materials as they are made available. Also, supplemental information on materials already discussed will be presented as necessary.

Materials Evaluated and Experimental Procedure

The materials used for the gamma irradiation studies reported here are listed in Table I. They are grouped in accordance with the general chemical type of the base polymer used in each material, and where possible, a brief description is given. This table first lists the miscellaneous elastomers and then the plastics materials of construction. Elastomers which belong in groups previously presented in the other articles follow the miscellaneous elastomers and plastics and are presented as "supplemental elastomers". Materials which are not proprietary items are described more fully in Table II, which gives recipes and cure schedules.

The studies reported herein were designed to provide information on the room temperature radiation resistance of the elastomers and plastics for screening purposes, for engineering data, and for future use when the irradiations will be carried out at higher temperatures and in other environments.

All materials were exposed to gamma radiation and evaluated by recording changes in physical properties as described previously *(1)*. For all irradiations up to and including 1×10^8 r a Cobalt-60 isotope source at Hanford was used. For the higher irradiations, spent fuel elements of the Materials Testing Reactor (MTR) were used. This latter source was used for the longer exposures because the higher dose rates obtainable at the MTR very significantly reduced the amount of

TABLE I—ELASTOMERS AND PLASTICS USED FOR GAMMA IRRADIATION STUDIES

Material Supplier and Designation	Type or Description (Post Cure)
ELASTOMERS	
BUTYL RUBBERS	
Precision Rubber Products Corp.	
PR 907-70	A proprietary material.
B. F. Goodrich Chemical Co.	
Hycar 2202*	GR-I-17 butyl rubber brominated to approximately 3%.
United States Rubber Co.	
HTB 8801	A proprietary material.
NATURAL RUBBER TYPES	
Hanford Experimental Material	
HW-B14*	Natural rubber—smoked sheet.
Natural Rubber Bureau	
TK 1/1	Graft polymer of styrene and natural rubber.
TK 1/4	Aniline reinforced natural rubber.
POLYSULFIDE	
Precision Rubber Products Corp.	
PR 1000-70	Thiokol polymer used. A proprietary material.
VINYLPYRIDINES	
Phillips Petroleum Co.	
Philprene VP-A-1*	A terpolymer of approximately 70% butadiene, 10% 2-methyl-5-vinylpyridine, and 20% acrylonitrile.
Philprene VP-A-2*	A terpolymer of approximately 70% butadiene, 10% 2-methyl-5-vinylpyridine, and 20% acrylonitrile.
Philprene VP-A-3*	A terpolymer of approximately 70% butadiene, 10% 2-methyl-5-vinylpyridine, and 20% acrylonitrile.
Philprene VP-15-1*	A copolymer of approximately 85% butadiene and 15% 2-methyl-5-vinylpyridine.
Philprene VP-25-1*	A copolymer of approximately 75% butadiene and 25% 2-methyl-5-vinylpyridine.
Philprene VP-25-2*	A copolymer of approximately 75% butadiene and 25% 2-methyl-5-vinylpyridine.
PLASTICS	
ETHYLENES	
Bakelite Division	
Bakelite DFD-4401	Polyethylene (low density type). Bakelite DFD-4401, Black-9955; number average molecular weight about 20,000; additives: channel black and antioxidant.
American Agile Corp.	
Agilene	Polyethylene (low density type); no additives; number average molecular weight about 22-24,000.
Koppers Company, Inc.	
Super Dylan 227-KSDM	Polyethylene (high density type).

Material Supplier and Designation	Type or Description (Post Cure)
PLASTICS *(Cont'd.)*	
VINYL CHLORIDES	
B. F. Goodrich Co.	
Koroseal 116 Black	Polyvinyl chloride.
Rubber and Plastics Compound Co.	
Nervastral HD	Polyvinyl chloride.
Metal and Thermit Corp.	
Unichrome 4140-1 Black	Polyvinyl chloride plastisol.
Michigan Chrome and Chemical Co.	
Miccrosol E-1003 Black	Polyvinyl chloride plastisol.
SUPPLEMENTAL ELASTOMERS	
ACRYLICS	
Precision Rubber Products Corp.	
PR 1213-70	A proprietary material.
FLUOROELASTOMERS	
DuPont Elastomer Chemicals Dept.	
Viton A-7*	A copolymer of vinylidene fluoride and hexafluoropropylene.
Viton A-8*	A copolymer of vinylidene fluoride and hexafluoropropylene.
Viton A-9*	A copolymer of vinylidene fluoride and hexafluoropropylene.
Viton A-10*	A copolymer of vinylidene fluoride and hexafluoropropylene.
Viton A-11*	A copolymer of vinylidene fluoride and hexafluoropropylene.
Precision Rubber Products Corp.	
PR 1710-X69	A copolymer of vinylidene fluoride and hexafluoropropylene. A proprietary material.
Westlake Plastics Co.	
Kel-F Elastomer 5500	A copolymer of trifluorochloroethylene and vinylidene fluoride. A proprietary material.
SILICONES	
Union Carbide Corp.	
Y-1888R	Methyl phenyl vinyl (4/350).
Y-1632	Methyl phenyl (8/480).
Dow Corning Corp.	
Silastic S2071	Methyl vinyl (8/480).
Silastic S6508	Methyl phenyl vinyl (1/480).
General Electric Co.	
SE-555T	Methyl phenyl vinyl containing small per cent titanium dioxide filler (3/400).
RTV-1	Room temperature curing material (16/30).
Stoner Rubber Co.	
SMR M-1	Silicone modified rubber; roll cured sheet.
SMR M-1 PS	Silicone modified rubber; press cured sheet.
SMR M-1 PBS	Silicone modified rubber; roll cured sheet; protected on both sides with an acrylic rubber.
SMR LW70A	Silicone modified rubber; neoprene base polymer used; press cured sheet.
URETHANE	
The General Tire and Rubber Co.	
Genthane S*	Not known.

* See Table II for recipe and cure schedule.

irradiation time. The results obtained from the irradiation of the same material to the same dose from both sources agree closely enough so that it can be assumed that the experimental results obtained are independent of the two sources *(1)*.

The data obtained from exposing the materials listed in Table I to various doses of gamma radiation in air at 25°C. at normal atmospheric pressure are presented in Table III. This table shows original property values opposite zero irradiation dose followed by per cent property changes resulting from various gamma radiation doses. Also shown opposite zero irradiation dose and under the remarks column is the original color of each material. Significant color changes and other observations needing comment are also noted in this column opposite the particular radiation dose causing the phenomena.

The data presented in Table III show how gamma radiation affects the physical properties of elastomers classed as butyl rubbers, natural rubber, polysulfide, and vinylpyridine, as well as additional materials belonging to elastomer classes previously given in the other articles —acrylic, fluoroelastomers, silicones, and urethane. This table also shows how gamma radiation affects the physical properties of a few plastics materials whose properties are somewhat similar to those of the elastomers—polyethylenes (low and high density types) and polyvinyl chlorides.

In most cases short and intermediate doses up to about 1 x 10^7 r do not affect the usefulness of the materials with the exception of the butyl rubbers. On continued exposure all of the materials examined were more or less severely damaged depending upon their chemical composition. The data also compare the effects of ionizing radiation on different classes of elastomers and plastics as well as materials within a class. This will be discussed in more detail on the following pages. Additional information on the effects of radiation on organic materials and details on the mechanisms of radiation damage to these materials have been previously referenced *(2)*.

Radiation Effects on Elastomers

Butyl Rubbers. Three materials in this class—isobutylene-isoprene copolymers—were evaluated for their resistance to the damaging effects of ionizing radiation: two proprietary materials (PR 907-70 and HTB 8801) and a brominated butyl rubber (Hycar 2202). All of these materials were affected quite similarly by exposure to radiation. In all instances both the tensile strength and hardness were decreased with increasing radiation dose. These property changes indicate that butyl rubber undergoes a considerable amount of chain cleavage as a result of exposure to radiation. The elongation of the materials, on the other hand, followed no definite pattern. This is because a certain amount of chain scission will reduce the elongation while excessive amounts tend to soften the materials to such an extent that they become capable of being extended to a considerable degree. All of the materials eventually became very soft, gummy and tarry.

There was no evidence of stress cracking in any of the materials. This is to be expected as the butyl rubbers are noted for their resistance to stress cracking by ozone. The brominated butyl rubber, Hycar 2202, appeared to be slightly more resistant to radiation than the other two materials. It is assumed that the addition of the bromine in the polymer was responsible for this.

In general, the butyl rubbers appear suitable for use in radiation fields only for applications which involve relatively low radiation doses, as they are among the organic materials of construction which are quite severely damaged by radiation.

Natural Rubber. The natural rubber types of materials evaluated included a compound from smoked sheet (HW-B14) and two modified compounds (TK 1/1 with styrene and TK 1/4 with aniline). All of these materials withstood the damaging effects of radiation quite well and still possessed a fair amount of flexibility after a dose of 1 x 10^9 r. They all failed the flexibility bend test after a dose of 5 x 10^8 r.

The hardness of these materials increased with increasing radiation dose while the elongation decreased. The tensile strength of the HW-B14 material was initially decreased, then remained fairly constant to a dose of about 5 x 10^8 r after which it increased at a great rate. The tensile strength of the TK 1/1 and 1/4 materials steadily decreased with increasing dose until an exposure of about 5 x 10^8 r was reached. After this dose the tensile strength began to gradually increase.

Several workers *(4, 5, 6)* have noted that natural rubber tends to become cross-linked from exposure to ionizing radiations. The rather large decrease in tensile strength exhibited by all of the materials suggests that perhaps other mechanisms such as chain cleavage and oxidation effects are competing with the cross-linking mechanism. Also, the cross-linking which is occurring might be between repeating units of a molecule rather than between different molecules. This type of cross-linking would not tend to raise the tensile strength to the degree that the other type would. The net effect, however, is a reduction in tensile strength at the radiation exposures in question. The increase in tensile strength eventually shown by all the materials suggests that cross-linking is predominating, and that the rate is greatly increased in the case of the HW-B14 compound. The differences shown in the tensile strength of the three materials are attributed to both the different type polymers used and the manner in which they were compounded.

There was no evidence of stress cracking out to a dose of 1 x 10^8 r when the specimens were stapled in the TK materials. HW-B14 was stress cracked at the relatively low dose of 5 x 10^6 r. This stress cracking became more severe with increasing exposure.

Polysulfide. Only one material, PR 1000-70, based on the polysulfide polymer Thiokol was evaluated. The hardness of this material did not change significantly out to a dose of 3 x 10^8 r. At 5 x 10^8 r this material had become so badly damaged that hardness could not be measured. At this dose both the elongation and tensile strength were reduced to zero after being gradually decreased with increased radiation dose. The trend of all the properties suggests that this material was undergoing chain cleavage. No stress cracks were observed at any of the exposures.

Vinylpyridines. The six different materials studied in this group represent compounds based on relatively new polymers. Compounds VP-A-1, VP-15-1 and VP-25-1

represent tread stocks while the other three compounds were quaternized with hexachloro-*p*-xylene and represent oil-resistant compounds. Due to the complex type of polymers involved and the variations in compounding ingredients, the discussion of these materials will be somewhat limited.

In general the vinylpyridines are quite resistant to the damaging effects of radiation, which is probably in large part due to the presence of the pyridine ring. The hardness of all the materials increased with increasing radiation exposure although not at the same rate. The elongation, on the other hand, decreased as the exposure was increased. Compounds VP-A-2 and VP-25-2, however, did not lose much of their elongation until after a dose of 1 x 10^7 r, while the other materials lost relatively more at the first exposure of 5 x 10^6 r.

The rates of elongation decrease were quite different. For example, VP-25-2, which did not lose a substantial amount until after 1 x 10^7 r, had lost 100% of its elongation at a dose of 5 x 10^8 r. On the other hand, VP-15-1, which lost a substantial amount at a dose of 5 x 10^6 r, still retained some of its elongation after an exposure to 5 x 10^8 r.

The tensile strength, as previously noted in other materials, does not follow a definite pattern. A comparison of the three tread stocks which had almost identical recipes shows that the tensile strength of VP-15-1 and VP-25-1 decreases with increased radiation exposure, although the VP-15-1 shows a tendency to have its tensile strength increased at the low exposures. VP-A-1 has its tensile strength increased, decreased, and finally increased again at the highest exposures.

A comparison of the VP-A compounds (one tread and two oil-resistant) shows that the tensile strength behavior is a function of the compounding ingredients and not upon the base polymer alone. This is further illustrated by examining the two oil-resistant VP-A stocks which differed only in the amount and type of filler used. The black loaded stock exhibited very little change in tensile strength until an exposure of about 5 x 10^7 r was reached, after which it was increased very rapidly with increasing exposure. The silica loaded stock showed quite a different trend. Here the tensile strength was reduced quite substantially at the low doses and remained at about the same level at intermediate doses before being increased at the higher doses.

A comparison of all materials with respect to retention of properties and flexibility out to the highest dose investigated, 5 x 10^8 r, shows that the VP-15-1 and the VP-25-1 materials (tread stocks) are the best of the compounds evaluated in the vinylpyridine class. Out of a dose of 3 x 10^8 r the VP-A-2 material appears to be equally as good. All materials did not stress crack at doses up to 1 x 10^8 r. At the higher exposures the materials were not stapled.

General. Graphic examples of how the physical properties of the four types of elastomers just discussed change from exposure to gamma radiation are shown in Figures 1 through 4. Illustrated in these figures are the butyl rubber PR 907-70, TK 1/1 modified natural rubber, PR 1000-70 polysulfide elastomer, and VP-25-1 vinylpyridine elastomer. As space precludes a graph on each of the materials studied, the illustrations here are meant to show in general how the various classes of elastomers are changed from exposure to radiation.

Radiation Effects on Plastics

The plastics materials selected have physical properties somewhat similar to those of the elastomers, and in many cases can perform the same type of service in such ap-

TABLE II—RECIPES AND CURES OF SOME OF THE ELASTOMERS TESTED

BUTYL RUBBER
(Cured 30 minutes at 280°F.)

Hycar 2202	100.00
Stearic acid	1.00
Zinc oxide	5.00
Philblack O	50.00
Blackbird sulfur	2.00
Benzothiazial disulfide	0.25
TMTD	0.50

VITONS
(Cured 30 minutes at 300°F.; post cured 24 hours at 400°F.)

Recipe Materials	A-7	A-8	A-9	A-10	A-11
Viton A	100.0	100.0	100.0	100.0	100.0
Zinc oxide	10.0	10.0	10.0	10.0	—
Dyphos	10.0	10.0	10.0	10.0	—
Litharge	—	—	—	—	20.0
Hi-Sil LM-3	25.2	—	—	—	—
Blanc Fixe	—	47.4	—	—	—
Iceberg Clay	—	—	28.4	—	28.4
Super Multifex	—	—	—	28.6	—
HMDA-Carbamate	2.0	2.0	2.0	2.0	2.0

NATURAL RUBBER—HW-14
(Cured 10 minutes at 311°F.)

Smoked sheet	100.00
Sulfur	2.75
Zinc oxide	5.00
Stearic acid	3.00
Pine tar	5.00
Altax	0.75
Tuads	2.00

PHILPRENES
(Cured 30 minutes at 307°F.)

Recipe Materials	VP-A-1	VP-A-2	VP-A-3	VP-15-1	VP-25-1	VP-25-2
Philprene VP-A	100.00	100.00	100.00	—	—	—
Philprene VP-15	—	—	—	100.00	—	—
Philprene VP-25	—	—	—	—	100.00	100.00
Philblack O	50.00	—	—	50.00	50.00	—
Thermax	—	150.00	—	—	—	150.00
Hi-Sil 233	—	—	65.00	—	—	—
Zinc oxide	3.00	—	—	3.00	3.00	—
Stearic acid	1.00	1.00	1.00	1.00	1.00	1.00
Flexamine	1.00	—	—	1.00	1.00	—
Circo-Para	10.00	—	—	10.00	10.00	—
Sulfur	1.75	0.25	0.25	1.00	1.00	0.25
Sulfasan R	—	—	—	1.50	1.50	—
NOBS Special	1.10	—	—	0.75	0.75	—
Plasticizer SC	—	20.00	20.00	—	—	20.00
Altax	—	3.00	3.00	—	—	3.00
Tuads	—	2.00	2.00	—	—	2.00
Hexachloro-*p*-xylene	—	5.00	5.00	—	—	10.00
NBC	—	1.50	1.50	—	—	3.00
BLE	—	3.00	3.00	—	—	3.00

URETHANE
(Cured 30 minutes at 320°F.)

Genthane S	100.0
Stearic acid	0.2
Philblack A	25.0
Dicumyl peroxide	1.6

TABLE III—EFFECTS OF GAMMA RADIATION ON THE PROPERTIES OF ELASTOMERS AND PLASTICS IN AIR AT 25°C. AT NORMAL ATMOSPHERIC PRESSURE

Materials	Dose ($r \times 10^{-6}$)	Initial Properties and Percent Change — Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
ELASTOMERS					
BUTYL RUBBERS					
PR 907-70	0	71	440	1490	Black
	1	0.0	— 1.9	— 5.5	
	5	0.0	— 5.5	— 6.9	
	10	0.0	— 12.4	— 27.9	
	30	—29.6	— 17.1	— 87.5	b
	50	—38.4	15.2	— 96.6	c
	60	—40.9	2.3	—100.0	d
Hycar 2202	0	73	345	2130	Black
	3	— 2.7	3.2	— 9.2	
	6	— 5.5	— 8.4	— 31.9	e
	30	—19.2	— 12.8	— 79.3	b
	60	—20.5	— 27.3	— 87.8	c
	90	—38.4	— 12.8	—100.0	d
HTB 8801	0	66	310	1395	Black
	5	— 4.6	6.5	— 46.7	
	22	—38.1	46.6	— 94.3	c
NATURAL RUBBER					
HW-B14	0	54	200	395	Brown
	5	3.7	— 22.5	— 17.0	f
	22	11.3	— 42.5	— 28.8	
	55	20.3	— 55.0	— 26.6	
	100	24.1	— 67.5	— 23.3	
	300	51.9	— 92.5	— 22.8	
	500	61.0	— 95.0	— 17.7	a
	1000	94.0	—100.0	171.6	a
TK 1/1	0	69	560	3695	Tan
	5	0.0	— 6.8	— 1.2	
	10	1.6	— 8.6	— 8.7	
	50	7.3	— 42.1	— 49.8	g
	100	8.7	— 66.8	— 74.2	g
	300	21.7	— 85.7	— 79.4	h
	500	24.6	— 94.6	— 85.0	a, h
	1000	40.6	— 96.4	— 61.5	a, h
TK 1/4	0	70	570	3910	Olive
	5	1.4	— 7.9	0.0	
	10	1.4	— 8.2	— 11.3	
	50	8.6	— 44.2	— 43.9	i
	100	10.0	— 68.4	— 69.9	g
	300	21.4	— 88.6	— 79.7	h
	500	24.2	— 94.7	— 84.2	a, h
	1000	35.7	— 96.5	— 76.5	a, h
POLYSULFIDE					
PR 1000-70	0	71	220	1065	Black
	5	1.4	— 8.0	2.3	
	30	2.8	— 27.3	— 4.2	
	55	2.8	— 40.0	— 12.2	
	100	— 1.4	— 50.4	— 28.5	
	300	0.0	— 71.7	— 50.6	a
	500	—	—100.0	—100.0	a, j
VINYLPYRIDENES					
Philprene VP-A-1	0	70	355	2455	Black
	5	7.1	— 15.0	17.8	
	10	8.6	— 24.9	19.1	
	50	17.1	— 54.7	25.8	
	100	22.9	— 70.3	15.0	
	300	35.7	— 92.9	— 41.3	a
	500	42.9	— 98.6	63.8	a
VINYLPYRIDINES (Cont'd.)					
Philprene VP-A-2	0	81	365	1855	Black
	5	3.7	— 4.6	— 0.5	
	10	3.7	— 6.0	1.3	
	50	8.6	— 49.6	2.2	
	100	14.8	— 68.7	11.8	
	300	18.5	— 86.1	56.3	
	500	23.5	— 98.6	106.8	a
Philprene VP-A-3	0	85	545	3805	Black
	5	2.4	— 29.1	— 27.4	
	10	3.5	— 30.0	— 27.0	
	50	7.1	— 54.0	— 20.5	
	100	9.4	— 77.9	— 30.4	
	300	15.3	— 90.8	— 11.8	a
	500	17.7	—100.0	12.3	a
Philprene VP-15-1	0	68	405	2790	Black
	5	5.9	— 21.9	7.6	
	10	8.8	— 23.8	8.8	
	50	16.2	— 59.4	— 7.5	
	100	23.5	— 73.0	— 15.4	
	300	32.4	— 88.9	— 34.4	
	500	41.2	— 95.1	— 37.7	a
Philprene VP-25-1	0	70	455	3125	Black
	5	4.3	— 22.0	— 2.4	
	10	5.7	— 23.2	— 3.6	
	50	14.3	— 53.9	— 8.3	
	100	20.0	— 69.3	— 10.0	
	300	28.6	— 89.0	— 27.3	
	500	35.7	— 93.4	— 50.1	a
Philprene VP-25-2	0	87	180	2115	Black
	5	2.3	0.0	1.9	
	10	3.5	0.0	2.3	
	50	5.6	— 35.8	11.8	
	100	8.1	— 58.1	24.3	
	300	11.5	— 83.2	42.2	a
	500	14.9	—100.0	26.3	a
PLASTICS					
ETHYLENES					
Bakelite DFD-4401	0	53D*	560	1820	Black
	1	0.0	12.1	5.7	
	5	0.0	13.9	26.2	
	10	0.0	2.8	43.1	
	50	3.8	— 57.7	12.5	
	100	7.6	— 80.4	4.7	
	300	11.3	— 92.4	26.0	a
	500	15.1	— 96.4	17.8	a
	1000	18.9	— 98.2	18.0	a
Agilene	0	53D*	525	1775	White
	1	0.0	20.0	13.0	
	5	0.0	18.1	37.9	
	10	0.0	1.9	42.8	k
	50	0.0	— 35.2	15.6	l
	100	3.8	— 80.0	4.3	m
	300	7.6	— 94.7	8.9	n, a
	500	11.3	— 97.2	10.0	o, a
	1000	15.1	— 99.0	— 6.7	p, a
Super Dylan	0	66D*	35	4370	Off-white
	5	0.0	14.3	2.8	
	10	0.0	— 14.3	1.7	q
	50	0.0	— 42.9	2.9	r
	100	4.6	— 42.9	6.6	s, a
	300	4.6	— 57.1	20.7	t, a
	500	9.1	— 85.7	22.0	u, a
	1000	9.1	— 85.7	16.3	v, a

* Shore D scale used for hardness.

TABLE III—EFFECTS OF GAMMA RADIATION ON THE PROPERTIES OF ELASTOMERS AND PLASTICS IN AIR AT 25°C. AT NORMAL ATMOSPHERIC PRESSURE *(Cont'd.)*

Materials	Dose ($r \times 10^{-6}$)	Initial Properties and Percent Change: Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
VINYL CHLORIDES					
Koroseal	0	82	325	2570	Black
	3	— 1.2	2.8	— 6.9	
	6	— 1.2	1.8	— 5.7	
	30	— 2.4	— 14.1	— 1.3	
	60	— 2.4	— 24.8	— 22.1	
	90	— 2.4	— 38.7	— 41.2	
	300	14.5	— 64.8	— 22.1	
	500	15.7	— 79.5	8.1	w
	1000	18.1	— 86.8	76.7	a
Nervastral HD	0	87	280	2375	Black
	5	0.0	— 1.8	— 3.4	
	50	— 3.5	— 3.6	— 12.6	
	100	— 3.5	— 27.1	— 13.3	
	300	— 3.5	— 51.8	— 17.3	e
	500	— 3.5	— 66.1	— 35.4	x
	1000	3.5	— 84.6	— 23.7	y
Unichrome	0	87	250	1800	Black
	5	1.2	0.0	14.1	z
	10	1.2	10.0	27.2	z
	50	1.2	20.5	6.4	e, z
	100	1.2	— 15.7	— 4.6	e, z
	300	2.3	— 43.8	— 2.4	aa
	500	5.6	— 77.9	— 2.7	aa
	1000	13.8	— 90.0	21.0	a,aa
Miccrosol	0	70	410	1615	Black
	5	0.0	19.8	7.0	
	10	0.0	— 3.4	1.8	
	50	— 2.9	— 20.3	— 8.2	
	100	— 5.7	— 26.7	— 31.4	
	300	— 7.1	— 58.4	— 45.0	bb
	500	—27.1	— 68.2	— 64.2	b
	1000	— 4.3	— 87.8	73.3	a, b
SUPPLEMENTAL ELASTOMERS					
ACRYLICS					
PR 1213-70	0	73	175	2055	Black
	5	0.0	2.9	0.2	
	22	1.4	— 14.3	— 9.1	
	55	4.1	— 31.4	— 23.3	
	100	8.2	— 42.6	— 29.5	
	300	21.9	— 82.9	— 38.5	a
FLUOROELASTOMERS					
Viton A-7	0	88	250	2270	Grey-brown
	100	12.5	— 94.0	6.8	a
Viton A-8	0	79	180	2285	Tan
	100	22.8	— 88.9	— 1.0	a
Viton A-9	0	78	165	1810	Tan
	100	24.4	— 84.7	46.3	a
Viton A-10	0	77	140	1765	Brown
	100	23.4	— 85.7	12.4	a
Viton A-11	0	79	125	2095	Dark grey
	100	24.1	— 80.3	27.9	a
PR 1710-X69	0	74	180	1525	Black
	100	23.0	— 86.1	18.5	a, e
Kel-F 5500	0	62	550	1810	Grey
	1	0.0	9.1	44.2	
	5	0.0	— 8.2	19.6	
	22	3.2	— 41.8	— 28.8	e
	55	16.1	— 73.6	— 24.9	y
	100	25.8	— 80.0	— 13.9	e

Materials	Dose ($r \times 10^{-6}$)	Initial Properties and Percent Change: Hardness Shore A; Δ%	Elongation %; Δ%	Tensile psi; Δ%	Remarks
SILICONES					
Y-1888R	0	50	600	1550	Red
	5	8.0	— 30.0	— 25.9	
	22	34.0	— 66.7	— 55.8	
	50	58.0	— 89.2	— 55.9	
	100	70.0	— 95.0	— 58.1	a
	300	92.0	—100.0	— 82.8	a
Y-1632	0	55	395	415	Grey
	5	5.5	— 12.4	32.7	
	22	14.6	— 45.4	65.6	
	55	27.3	— 70.8	86.0	
	100	47.3	— 87.3	34.4	a
Silastic S2071	0	54	350	975	Red
	5	9.3	— 26.7	1.4	
	10	18.5	— 49.7	— 3.8	
	50	53.7	— 86.2	— 23.1	a
	100	57.4	— 91.4	— 20.9	a
	300	81.5	—100.0	— 25.4	a
Silastic S6508	0	28	600	770	White
	1	7.1	— 4.2	6.8	
	5	28.6	— 26.7	8.2	k
	10	46.8	— 40.0	8.3	m
	50	135.7	— 88.3	— 35.7	n
	100	175.0	— 93.3	— 38.3	cc, a
	300	242.9	—100.0	— 54.4	cc, a
SE-555T	0	60	535	1575	White
	22	15.0	— 62.6	— 38.4	
	55	36.7	— 87.9	— 50.3	
	100	41.7	— 92.5	— 53.8	a
RTV-1	0	70	110	530	Red
	5	4.3	0.0	23.4	
	22	8.6	— 46.4	— 1.9	
	55	20.0	— 72.7	17.7	a
	100	25.7	— 77.7	3.8	a
SMR M-1	0	69	900	2380	Brown
	5	4.4	— 25.6	21.2	
	22	20.3	— 71.7	— 22.6	
	55	33.3	— 95.6	— 45.7	a
	100	42.0	— 97.8	— 14.6	a
SMR M-1 PS	0	71	900	2500	Brown
	5	4.2	— 23.3	51.1	
	22	18.3	— 70.0	— 9.1	
	55	31.0	— 94.4	— 44.2	a
	100	38.0	— 97.8	— 10.6	a
SMR M-1 PBS	0	71	830	1150	Brown
	5	2.8	— 31.3	26.0	
	22	16.9	— 80.7	— 19.9	
	55	23.9	— 95.6	— 24.5	
	100	32.4	— 97.6	15.6	a
SMR LW70A	0	69	930	2600	Brown
	6	8.7	— 31.7	— 5.9	
	60	27.5	— 90.3	— 51.9	
URETHANE					
Genthane S	0	70	500	4040	Black
	5	— 2.9	3.0	— 6.9	
	10	— 5.7	— 1.0	— 12.3	
	50	—18.6	— 54.0	— 48.0	e
	100	—20.0	— 63.0	— 56.6	b
	300	—30.0	— 86.0	— 75.8	c
	500	—45.7	— 86.0	— 96.3	d
	1000	17.1	— 95.0	— 85.0	b

a = Broke when bent 180°; b = Quite soft and tacky; c = Very soft and gummy; d = Extremely soft and gummy, almost tarry; e = Slightly tacky; f = Stress cracks first noticed at this dose; g = Darker tan; h = Brown; i = Greenish-tan; j = Could not test—crumbly, cheesy, tacky; k = Light yellow tint; l = Reddish-tan tint; m = Light yellow; n = Yellow; o = Orange-brown; p = Very dark amber; q = Faint amber tint; r = Slightly darker amber; s = Cream-tan; t = Darker cream-tan; u = Olive; v = Darker olive; w = Crazed but did not break; x = Quite tacky; y = Glossy on surface, quite tacky; z = Slightly oily on surface; aa = Not oily, appeared "dry;" bb = Becoming softer; cc = Bright yellow.

Property changes of elastomers induced by gamma radiation in air at 25°C. at normal atmospheric pressure.

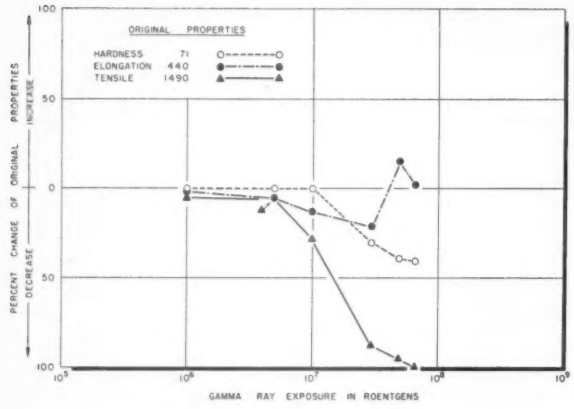

FIG. 1—PR 907-70 butyl rubber.

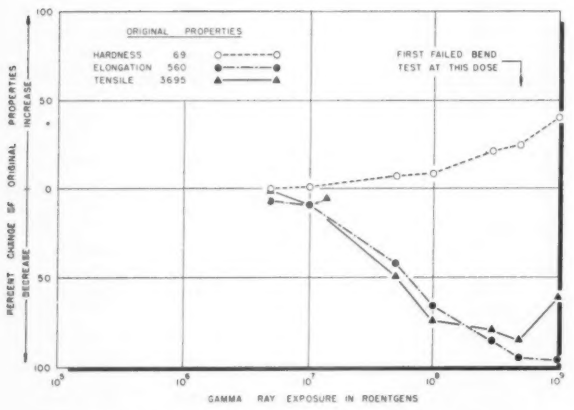

FIG. 2—TK 1/1 styrene-modified natural rubber.

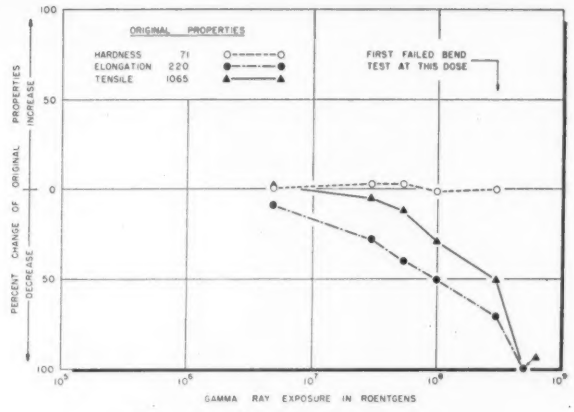

FIG. 3—PR 1000-70 polysulfide elastomer.

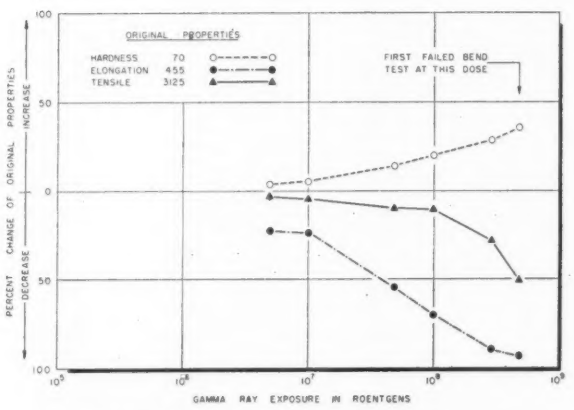

FIG. 4—Philprene VP-25-1 vinylpyridine elastomer.

plications as seals, electrical insulation and coatings. The exception to this was the inclusion of the rigid high density polyethylene which was done merely for comparative purposes against the conventional low density flexible polyethylenes. These materials, like the elastomers, were more or less severely damaged depending upon their chemical composition. They were all taken out to a dose of 1 x 10^9 r.

It should be noted that, by coincidence, these materials are representative of thermoplastics which are quite resistant to radiation and are not representative of plastics materials in general. There are many materials (e.g., the fluorocarbons) which are inferior, and many materials which are superior (e.g., the thermosetting phenolic resins).

Ethylenes. Three polyethylene materials were evaluated for their resistance to the damaging effects of gamma radiation: two conventional or low density materials—Agilene (with no additives) and Bakelite DFD 4401 containing carbon black and an antioxidant—and a linear or high density type, Super Dylan.

The two low density materials behaved very similarly, suggesting that the carbon black and antioxidant additives have less effect on the behavior of the materials than the base ethylene polymer. These materials, unlike others presented to date, are actually beneficially affected by low and sometimes intermediate doses of radiation. Out to an exposure of about 1 x 10^7 r both the tensile strength and elongation are improved. Beyond this exposure the elongation is lowered with increasing radiation dose. The tensile strength, on the other hand, is lowered progressively out to a dose of about 1 x 10^8 r but does not drop below the original value. Continued exposure again raises the tensile strength out to a dose of 3 x 10^8 r after which it is lowered again.

The Agilene material had its tensile strength more drastically lowered than did the Bakelite material at the highest dose (1 x 10^9 r) examined. This difference in tensile strength behavior is essentially the only one noted in the two materials and possibly could have been due to the additives in the Bakelite polymer which only became apparent after a high dose. The hardness of all materials increased with increasing radiation exposure.

The high density Super Dylan differed in behavior from the other materials in both tensile strength and elongation. The elongation was improved slightly at the low exposures but dropped off rather quickly and was continuously lowered as the dose was increased. The tensile strength remained essentially unchanged until a dose of 1 x 10^8 r was reached. After this dose the tensile strength changed in essentially the same fashion as the Bakelite material.

Property changes of vinyl chlorides induced by gamma radiation in air at 25°C. at normal atmospheric pressure.

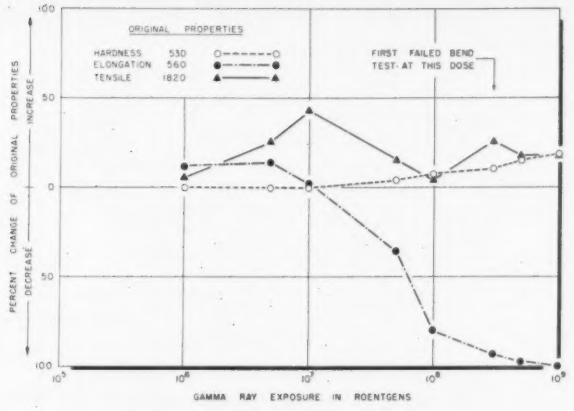

FIG. 5—Bakelite DFD-4401 polyethylene.

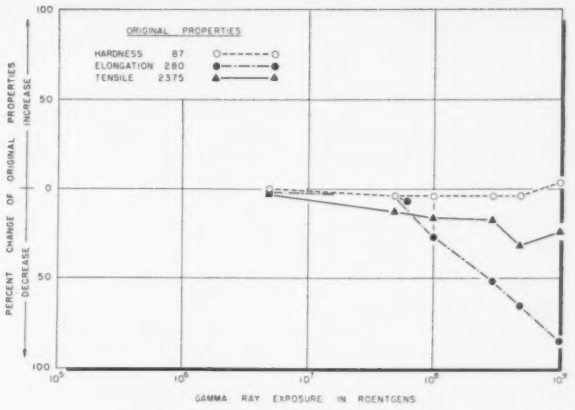

FIG. 6—Nervastral HD polyvinyl chloride.

Many articles have been written on the effects of radiation on polyethylene materials and the reader is urged to consult the literature for further information. Two such articles *(7, 8)* are listed for reference purposes.

It should be noted that polyethylene, because it is quite susceptible to oxidation, behaves quit differently in a radiation field when exposed in thin films. Here oxidation effects are more pronounced and radiation induced oxidation will severely damage the material at intermediate exposures. For example, a two mil film of high density polyethylene was badly embrittled and had lost all of its tensile strength and elongation at a dose of 5×10^7 r *(9)*. The low density materials in thin films were not affected to the same degree which in all probability was because they are not so crystalline. A graphic representation of how Bakelite is changed by radiation is shown in Figure 5.

Vinyl Chlorides. The polyvinyl chloride materials studied consisted of two calendered sheet compounds (Koroseal and Nervastral) and two plastisols (Unichrome and Miccrosol). These materials as a whole were quite resistant to the damaging effects of radiation, still possessing a fair degree of property usefulness at the high exposures.

Koroseal and Nervastral appeared to be better than the plastisols which was probably because they were more rigid and contained less plasticizer. Also, they exhibited much less tackiness during the irradiations. They behaved quite similarly with initial lowering of hardness followed by an increase with increased radiation exposure. This was also true of the tensile strength.

The Nervastral material, however, did not change as much in magnitude with respect to tensile strength and hardness as did the Koroseal, and the property changes were also held to more of a minimum with increasing radiation dose. The elongation of both materials was decreased with increased exposure. The Nervastral did not break when subjected to the bend test after an exposure of 1×10^9 r.

The plastisols showed an improvement in tensile strength and elongation at the low exposures with the Unichrome maintaining these improvements to a greater dose. The elongation of both materials was then reduced with increased exposure while the tensile strength of the Miccrosol was also lowered. The tensile strength of the Unichrome material was lowered, remained fairly constant and then was increased. The hardness of both plastisols was essentially unchanged out to a dose of 5×10^7 r, after which that of the Unichrome increased while that of the Miccrosol decreased.

All of the vinyl chloride materials with the exception of the Unichrome plastisol appeared to be undergoing chain scission as evidenced by the hardness decrease and tackiness of the materials. When a substantial increase in tensile strength was observed, it is concluded that cross-linking was predominating. Figure 6 shows how the properties of Nervastral are affected by exposure to gamma radiation.

Supplemental Elastomers

Data are presented in Table III on nineteen materials from the acrylic, fluoroelastomer, silicone, and urethane classes of materials which have been previously discussed. The materials reported here were studied too late for inclusion in the articles and are given for supplemental information. The Stoner silicone modified rubbers *(10)* were included in the silicone elastomer class because they all have in common silicone-coated filler although the base polymer is different.

Acrylic. The principal difference in the behavior of PR 1213-70 acrylic elastomer from those previously discussed was exhibited in the tensile strength which decreased with increased radiation exposure. Hardness and elongation were more or less typical of the other acrylics.

Fluoroelastomers. The series of Viton A materials showed no appreciable difference from the others previously discussed. A limited supply of test specimens precluded studying these materials at more than one dose.

The Kel-F elastomer compound appeared to be superior to the material discussed before. At a dose of 1×10^6 r both elongation and tensile strength were somewhat improved. On prolonged exposure the tensile decreased until a dose of 5×10^7 r was reached, after which it assumed an increasing trend. The elongation continued to decrease. The hardness remained essentially the same as the original value out to a dose of 5×10^7 r after which it increased with increased radiation exposure. Tackiness and decreases in tensile strength and elongation suggest

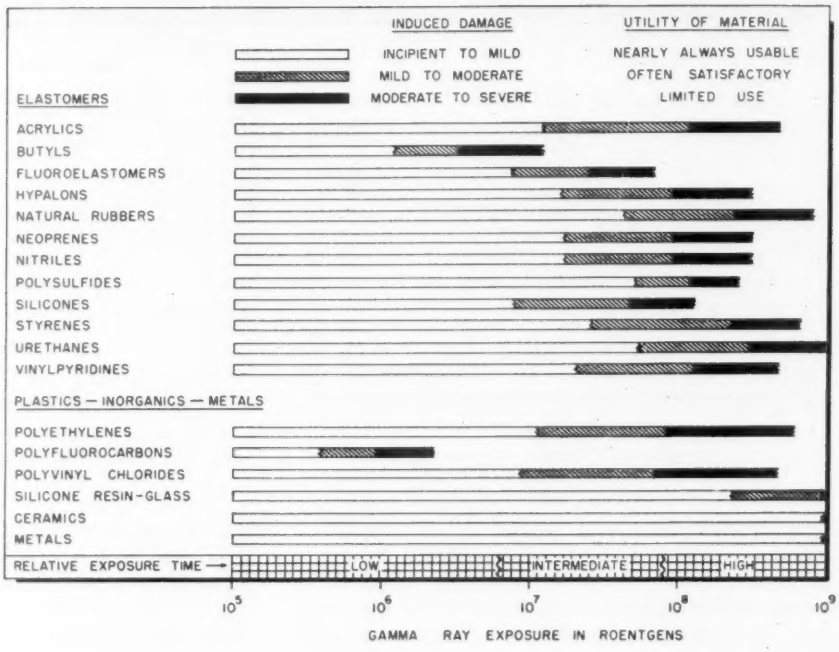

FIG. 7—Relative radiation resistance of elastomers and other materials.

that out to a dose of about 5 x 10^7 r the material is undergoing chain cleavage. After this it appears that cross-linking is predominating.

Silicones. All of the silicone elastomers studied appeared to behave similarly to their counterparts previously discused with the exception of Y-1632. This material had substantially a higher phenyl content than the other phenyl type silicones but showed a greater loss in properties.

The incorporation of a small percentage of titanium dioxide filler in SE-555 did not change the radiation resistant characteristics of the base material.

The Stoner silicone modified rubbers (SMR) decreased in elongation and increased in hardness with increasing radiation exposure. The tensile strength, with the exception of the SMR LW70A material, was initially improved and then lowered until a dose of about 6 x 10^7 r was reached. After this dose the tensile strength was increased at a rapid rate. The LW70A compound was not studied over the same range as were the others. It is assumed, however, that its behavior would follow the pattern of the other materials had it been exposed to both the lower and higher doses.

Urethane. The Genthane S isocyanate-urethane elastomer behaved in a manner quite similar to the urethanes previously discussed.

Summary

Physical property changes induced by exposure to gamma radiation of several classes of elastomers (butyl rubber, natural rubber, polysulfide, and vinylpyridine) and rubberlike plastics (polyethylene and polyvinyl chloride) have been presented. All materials were exposed to doses from 1 to 1000 x 10^6 r depending upon their resistance to the damaging effects of radiation. In addition, data have been presented on several materials belonging in elastomer classes presented in the previous articles but which were evaluated too late for inclusion in this article Each material, because of space limitations, could not be treated individually and the reader is urged to make his own comparisons or examinations on those materials in which he has an interest.

Of the elastomeric materials studied here, the natural rubber types appeared to be superior in their resistance to radiation damage with the vinylpyridines a close second. The polyethylenes and polyvinyl chloride plastics appeared to be about equal. Although the latter materials did not become rigid and embrittled to the same degree as the polyethylenes, they did exhibit a certain amount of tackiness which is the principal reason for "downgrading" them slightly. The polyethylenes failed the bend test after an exposure of 3 x 10^8 r but still maintained a good deal of their original toughness and general physical strength. At the low exposures radiation improves the properties of these materials. The foregoing applies only to the low density type ethylene polymers.

Discussion

This article concludes the general presentation of damaging effects of radiation on elastomers and some rubberlike plastics in air at 25°C. and normal atmospheric pressure, as the majority of the older and newer available materials have been covered. All classes have not been studied completely, but those materials within a class which have been shown illustrate in general how the class is affected by exposure to ionizing radiation. Future articles, in addition to covering other aspects, will include engineering damage data to supplement as necessary the information presented to date.

Of all the classes of materials studied, the isocyanate-urethane type elastomers appear to best resist the damaging effects of radiation while the butyl rubbers appear to be the least radiation resistant. Figure 7 shows how

elastomers compare with other types of materials of construction with respect to damage induced by gamma radiation. This type of illustration should be considered general in nature because of the relative comparisons shown and because of the difficulty of ranking the different classes of materials caused by the overlapping of many of the compounds within a class with those of another class. It should be remembered that this figure considers only resistance to radiation and that a consideration of other environments could obviously change the order in which the materials are ranked. Also, it is necessary to take as many properties into account as possible to best study the behavior and effects of materials exposed to radiation. This is particularly true for applications which do not require that all property changes be held to a minimum. For example, a substantial loss in elongation will not affect the utility of many types of seals.

It has been shown that the damage induced in organic polymers is the result of chemical changes taking place in the structure of the material which lead to either cross-linking or chain cleavage, which can both be occurring at the same time usually with one predominating, at a given radiation exposure. How a styrene elastomer is cross-linked to become stiff and brittle at a dose of 1×10^9 r is illustrated in Figure 8. The material before irradiation is quite flexible and will not support a load. After irradiation the material is rigid enough to support a considerable amount of weight.

In general, the elongation of elastomers and plastics decreases with increased exposure to radiation. The notable exceptions to this occur at the low and intermediate doses when the elongation of a few materials is improved. Also, the materials which are chain cleaved severely are often so soft that their elongation is increased.

Hardness, quite similar to elongation, is usually increased with increased radiation dose for materials which cross-link and is decreased when chain cleavage is predominating. The tensile strength, on the other hand, is less predictable and will exhibit many trends. All materials generally will become stiff and brittle if given sufficiently high doses of radiation. This also includes many of the materials which chain cleave but then appear to undergo cross-linking and become stiff again. Butyl rubber is a notable exception to this.

FIG. 8—Effect of gamma radiation on the stiffness of a styrene elastomer. Before irradiation, the specimen (left) is quite flexible; after irradiation to 1×10^9 r the specimen (right) becomes quite stiff and will support a considerable load.

ACKNOWLEDGMENT

Acknowledgment is made to the various suppliers of materials for their cooperation in submitting test samples and pertinent materials information. It should be noted that many of the materials evaluated might never have been developed or intended by the manufacturers for the conditions to which they have been subjected. Any failure or poor performance of a material is not necessarily indicative of the utility of the material under less stringent conditions or for other applications.

Acknowledgment is also made to D. L. Hunke of the Phillips Petroleum Co., Idaho Falls, Idaho, operators of the Materials Testing Reactor for the A.E.C.; and to S. W. Smith and F. M. Newby of the Hanford Atomic Products Operation, General Electric Co., for their assistance and cooperation in carrying out the irradiations.

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► A **"memory meter"** that retains indefinitely a reading taken at any desired instant has been developed by Assembly Products, Inc., Chesterland, Ohio. The meter is especially suitable for applications where readings at a given time must be known but cannot be noted immediately.

► A complete line of lever-actuated tandem mounted 3- and 4-way **control valves** with neutral position, especially designed for the solution of unusual valving problems in up to 250 psi pneumatic, 325 psi oil or vacuum service, has been announced by Valvair Corp., 434 Morgan Ave., Akron 11, Ohio.

► A **power turntable,** available in diameters of 4, 5 and 6 feet, has been developed by Rapids-Standard Co., Inc., Grand Rapids, Mich. Improvements in the design include a die-formed table top that provides a flat, true surface for smooth, easy transfer of goods between adjoining conveyors, and a drive arrangement for quiet efficient operation.

► A **variable height loading dock,** the Portelvator, manufactured by Hamilton Tool Co., Hamilton, Ohio, is designed to maintain constant level with truck beds, thus eliminating ramps, and may be positioned and removed from position by overhead crane.

Chemical-Loaded Molecular Sieves in Rubber Compounding

Latent curing aids make practical use of highly active materials to obtain faster, more effective curing systems, while still maintaining processing safety

WHAT are molecular sieves? Molecular sieves are man-made crystalline alumino-silicate materials, chemically similar to many natural clays and feldspars, belonging to a class of minerals known as zeolites. A model of a molecular sieve crystal unit is seen in Figure 1. An outstanding characteristic of these zeolite materials is their ability to undergo dehydration with little or no change in crystal structure. The dehydrated crystals are interlaced with regularly spaced channels of molecular dimensions. The network of uniform pores comprise almost 50 per cent of the total volume of crystals.

The empty cavities in dehydrated molecular sieve crystals have a strong tendency to recapture the water molecules that have been driven off. This tendency is so strong that if no water is present they will accept any material that can get into the cavity. However, only those molecules which are small enough to pass through the pores of the crystal can enter the cavities and be adsorbed on the interior surface. Various types of molecular sieves are available to adsorb both large and small compounds. This sieving or screening action gives rise to the name used for these materials.

Chemical-loaded molecular sieves are molecular sieves with chemically active materials "locked" within their pore structures by the strong adsorptive forces. These sieves find application in rubber and plastics compounding if the locked-in materials are curing agents or accelerators, or other materials used in the compounding. The function of the sieve is to isolate the active compounds from the rubber or resin during processing and storage. At curing temperatures, which are generally higher than processing temperatures, the active compound is released from the sieves to accelerate the curing reaction. This delayed release of the agent is effective in preventing premature curing, and may also be used to achieve other compounding advantages.

Molecular sieves have a high affinity for polar molecules and will adsorb them in preference to non-polar compounds. Generally speaking, the more polar the molecule, the stronger it is held within the crystal. The materials used in the rapid curing of rubber and resins are generally very polar compounds. The ability of molecular sieves to adsorb these molecules, lock them within their pore systems, and then release them when heat is applied has led to their development as latent curing agents for rubber and plastics.

A large number of different compounds, including amines and peroxides, have been loaded on the sieves and evaluated as latent curing aids. Products now available in commercial quantities are piperidine, di-*n*-butylamine, catechol, diethyl thiourea, and di-tertiary butyl peroxide. Other materials are being studied. At present the chemical-loaded molecular sieves can be used as latent accelerators and curing agents in a variety of materials, including styrene rubber, natural rubber, neoprene, nitrile rubber, epoxy resins and rigid vinyl plastisols. Their commercial applications in numerous items, such as tires, mechanical goods, hose, belting and footwear, are being investigated.

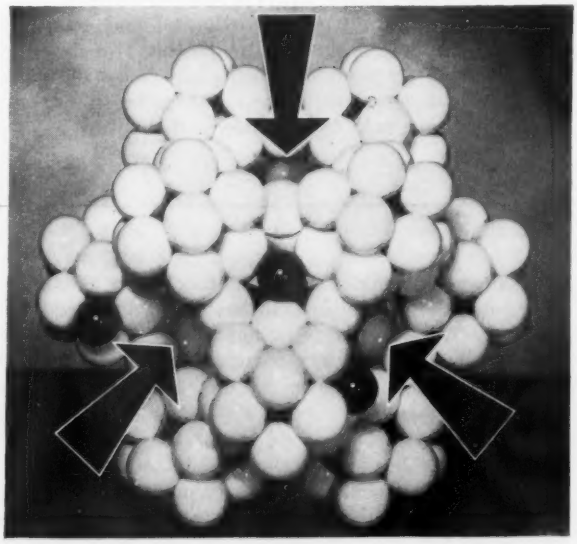


FIG. 1—Model of a molecular sieve crystal unit showing how the arrangement of atoms forms several pores (indicated by arrows) opening into a single cavity.

About molecular sieves...

The need for faster curing systems which are not conducive to scorch and other processing or storage limitations has been experienced by most modern rubber and plastics fabricators. The use of more active agents to obtain these rapid curing reactions has been restricted, however, due particularly to difficulty in controlling their effects on rate of cure at the high temperatures used in processing rubber. A series of latent curing aids introduced by Linde Co., Division of Union Carbide Corp., now promises that highly active materials can be used to obtain faster, more effective curing systems, while still maintaining processing safety. The Linde Chemical-loaded Molecular Sieves, as these products are called, may bring about basic changes in compounding procedures.

Brief references to molecular sieves, for application in various commercial processes, have appeared from time to time over the past several years in the chemical literature. Their potential use as a solution to the problem of scorch produced by accelerators which cure the compound too quickly, as well as other compounding problems, has also been rumored in the rubber industry. Now, the Linde Chemical-loaded Molecular Sieve is being launched commercially. A paper on its use in rubber compounding, "Chemical-loaded Molecular Sieves as Latent Curing Aids: Secondary Accelerators in Butadiene-Styrene Rubbers," by F. M. O'Connor, T. L. Thomas, and M. L. Dunham, was presented at the meeting of the Division of Rubber Chemistry, American Chemical Society, in May. This paper is scheduled for publication in a forthcoming issue of *Industrial and Engineering Chemistry*. The April issue of RUBBER AGE carried a report in its News Section of use of the molecular sieve in a curing compound for silicone rubber.

Harwick Standard Chemical Co., Akron, Ohio, has been named distributing agent for the Linde Chemical-loaded Molecular Sieve to be used in the curing of rubber and plastics. The accompanying material, which fully describes molecular sieves, was furnished by Linde Co.

Latent Curing Effect

The ideal curing system for rubber and plastics formulations has two primary requisites. First, it should be inactive during processing and storage of the compound, and second, it should bring about rapid curing with the attainment of good physical properties. Most formulations utilize accelerators in order to bring about curing in reasonable lengths of time. However, those accelerators which give rapid curing formulations are generally too active during processing. This may lead to prematurely cured formulations which must be discarded. Those accelerators having good processing properties, on the other hand, result in relatively slow curing compounds, which can restrict production capacity.

In rubber compounding, this has led to the use of combinations of accelerators—a primary which is the actual catalyst and a secondary (commonly called activator) which increases the catalytic activity of the primary accelerator. The ideal secondary accelerator is one which has little or no effect on the primary accelerator during processing or storage, but has a very pronounced and immediate effect at the vulcanization temperature. Chemical-loaded molecular sieves, because of their unique temperature-sensitive properties, approach this ideal behavior and, therefore, serve as effective secondary accelerators.

Chemical-loaded molecular sieves allow the use of very active or volatile compounds simply because they can be effectively locked in the molecular sieve and held inactive at ambient or processing temperatures. Then, during the curing operation, the active compound is released almost 100% into the system to speed up the rate of cure. Fast cures are thus obtained without sacrificing processing safety or pot life.

For example, Figure 2 shows that in the absence of an accelerator a Neoprene W formulation has very good processing safety as shown by a long Mooney scorch time at 250°F. The formula used was:

	phr
Neoprene W	100.0
SRF Black	30.0
Neozone A	1.0
Stearic Acid	0.5
Zinc Oxide	5.0
Magnesium Oxide	2.0
Accelerator	As shown

On the other hand, this formulation cures very slowly at a vulcanization temperature of 307°F.

Catechol is known to be a powerful accelerator for neoprene vulcanization. The figure shows that when this compound is added to the formulation very good physical properties are obtained after curing for only seven minutes at 307°F. But, compounds containing this accelerator have such a short Mooney scorch time (3.5

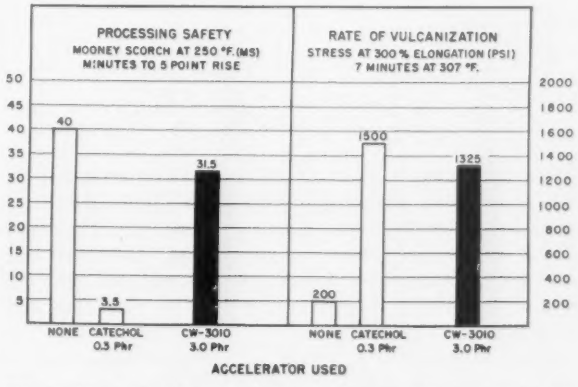


FIG. 2—Effect of adding catechol to a Neoprene W compound in its original state and adsorbed on molecular sieve.

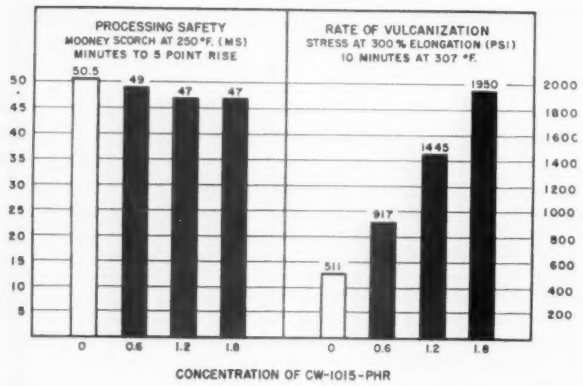


FIG. 3—Effect of adding increasing quantities of piperidine-loaded sieve (CW-1015) to a styrene rubber compound.

minutes) at 250°F. that processing them is almost impossible.

Catechol-loaded sieve (CW-3010) offers a very substantial increase of 28 minutes in Mooney scorch time at 250°F. over that obtained with catechol alone. This indicates that the catechol is isolated from the rubber system during processing. The catechol is released into the system during vulcanization at 307°F. to accelerate the cure. This is evidenced by the excellent physical properties obtained after seven minutes.

Concentration and Processing Safety

The ability of molecular sieves to isolate the adsorbed active compound from the rubber system until it is released during vulcanization allows the use of varying concentrations of loaded sieves without affecting the processing safety. Generally speaking, this has not been possible with conventional accelerators. Higher concentrations of loaded sieves can thus be used to obtain more rapid cure rates without any serious loss in processing safety.

As shown in Figure 3, increasing concentration of piperidine-loaded sieve (CW-1015) from 0.6 to 1.8 phr had essentially no effect on the Mooney scorch time at 250°F. of a synthetic tire tread compound. The complete formula was as follows:

	phr
Styrene Rubber	100.0
HAF Black	50.0
Zinc Oxide	5.0
Stearic Acid	2.0
Antioxidant	1.0
Sulfur	2.0
NCBS	1.0
Piperidine-loaded Sieve (CW-1015)	As shown

The cure rate at 307°F., however, was substantially increased at the higher concentrations. These data illustrate how effectively the adsorbed accelerator is isolated from the rubber formulation during processing at 250°F., and also how effectively it is released into the system during vulcanization at 307°F. to accelerate the cure rate.

The temperature at which an adsorbed compound is released from molecular sieves is a function of its volatility. Therefore, low boiling materials, released at relatively low temperatures, are useful in formulations which are processed and stored at low temperatures. These compounds will be released from the molecular sieve at relatively low curing temperatures. Higher boiling materials, on the other hand, will be released at relatively high temperatures and are useful in formulations which are processed at elevated temperatures. Somewhat higher curing temperatures will be required with these compounds.

Figure 4 illustrates the effect of the volatility of various amines adsorbed on molecular sieve on the processing and vulcanizing characteristics of a typical synthetic tire tread recipe in which the amine is used as a secondary accelerator. The formula is the same as the one given above except that the amine-loaded sieve is substituted for the piperidine-loaded sieve. The shortest scorch time and fastest rate of cure were obtained with the most volatile amine (pyrrolidine) loaded on molecular sieve. This amine is released, at least partly, at 250°F., to shorten the scorch time and is rapidly released at 307°F. to accelerate the cure rate.

Piperidine is well isolated from the formulation by the molecular sieve at 250°F. since there is no reduction in the Mooney scorch time over that obtained in the absence of a secondary accelerator. During vulcanization at 307°F., however, piperidine is also released rapidly, as shown by the fast rate of vulcanization. Morpholine and di-*n*-butylamine are also withheld from the formulation by the molecular sieve at 250°F. This is expected since these amines are less volatile than piperidine. However, during vulcanization at 307°F., these amines are not released into the system as rapidly as piperidine, as shown by the slower rate of cure which these materials impart to the formulation.

Advantages and Properties of Loaded Sieves

This technique of loading molecular sieves with compounds useful in accelerating chemical reactions allows the use of materials previously considered of little commercial interest. It has been shown that these materials, too active for practical processing, may now be used with safety. In the adsorbed state other undesirable properties are also controlled. The volatility is decreased, thus

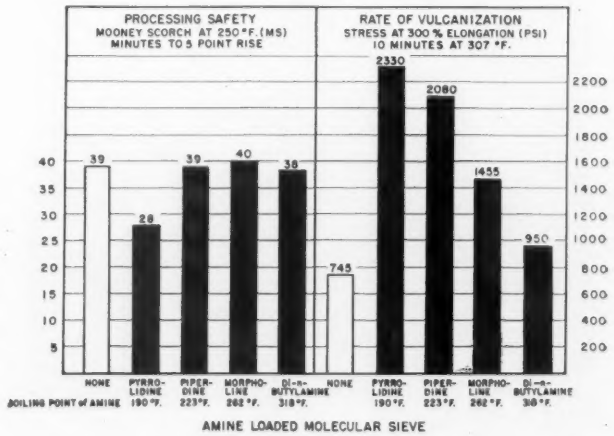


FIG. 4—Effect of volatility of various amines adsorbed on molecular sieve on a styrene rubber compound.

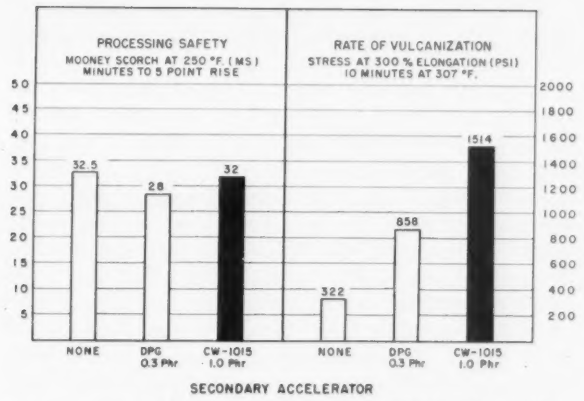


FIG. 5—Effect of adding diphenyl guanidine (DPG) and piperidine-loaded molecular sieve (CW-1015) to a styrene rubber formulation.

allowing materials which would have been lost from the system during compounding and storage, to be incorporated into formulations and effectively utilized. In addition, the inflammability and toxicity of volatile compounds are decreased due to their greatly reduced vapor pressure when adsorbed on molecular sieves.

The molecular sieve used to carry these active compounds is a fine powder having a particle size of about 1 to 5 microns. This inert material has essentially no effect during processing or after vulcanization on the properties of the formulations in which it is dispersed. When loaded with an adsorbed chemical, the molecular sieve powder is free flowing and disperses readily in rubber formulations using the standard mixing technique recommended by the American Society for Testing Materials.

Loaded sieve secondary accelerators are useful under the following conditions:

(1) If a formulation requires additional processing safety and an increased rate of cure;

(2) If a formulation requires a faster cure rate without further loss in processing safety,

(3) If a formulation must maintain its original cure rate but requires additional processing safety.

In the first of these conditions, if only a primary accelerator is present in a formulation, it is possible to get an increase in scorch time only by decreasing the concentration of that accelerator, or by substituting a different primary accelerator. However, addition of piperidine-loaded sieve (CW-1015) to this formulation will give an increased rate of cure without any loss in processing safety.

If the formulation contains both a primary and a secondary accelerator, it is recommended that a loaded sieve be substituted for the conventional secondary accelerator. In this way, an improved scorch time will be obtained. The concentration of loaded sieve in the recipe can be adjusted to give the desired rate of cure without affecting the processing safety.

Figure 5 shows that in a typical synthetic tire tread recipe (the same styrene rubber recipe described above except that one part of benzothiazyl disulfide replaced the NCBS as primary accelerator and the secondary accelerators were as shown in the figure) addition of diphenyl guanidine increases the rate of cure and also causes a reduction in scorch time. If piperidine-loaded sieve (CW-1015) is substituted for diphenyl guanidine, the processing safety is equivalent to the formulation containing no secondary accelerator while the cure rate is faster than was obtained with the conventional secondary accelerator present. The maximum scorch time is that obtained with no secondary accelerator in the recipe.

In the second case—a formulation requires a faster cure rate without further loss in processing safety—if it contains only a primary accelerator, piperidine-loaded sieve (CW-1015) may be added to give a substantial increase in rate of cure without shortening the scorch time. This is illustrated in Figure 5 where addition of piperidine-loaded sieve resulted in a marked increase in cure rate while scorch time remained unchanged.

Also, it is possible to use loaded sieves in combination with other secondary accelerators. In a styrene rubber tire tread compound (the same formula as the one given above except that one part NOBS was substituted for the NCBS and the secondary accelators were as shown in Figure 6) piperidine-loaded sieve (CW-1015) may be added to increase the rate of cure without shortening the scorch time. Increasing the concentration of conventional secondary accelerator, however, while increasing the rate of cure, also causes a definite decrease in the Mooney scorch time (Figure 6).

In the third case—if a formulation must maintain its original cure rate but requires additional processing safety—a formulation containing both a primary and a secondary accelerator can be given an increased Mooney scorch time, as shown in Figure 7, by decreasing the concentration of the secondary accelerator. (The recipe for this compound was the same as that given previously for a styrene rubber tread rubber stock with one part NCBS used as the primary accelerator and secondary accelerators as shown in the figure.) In decreasing the amount of secondary accelerator the rate of cure, as would be expected, also decreases, and it is necessary to add piperidine-loaded sieve (CW-1015) to the adjusted formulation to regain the cure rate obtained at the higher concentration of conventional secondary accelerator, while maintaining the improved processing safety obtained with the lower concentration.

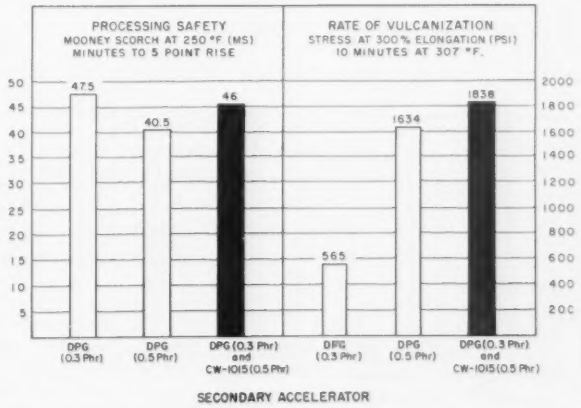


FIG. 6—Effect of adding diphenyl guanidine (DPG) by itself and in combination with piperidine-loaded sieve (CW-1015) to a styrene rubber compound.

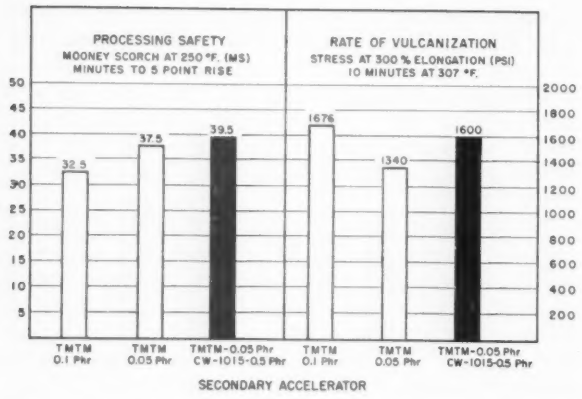


FIG. 7—Effect of adding tetramethyl thiuram monosulfide (TMTM) by itself and in combination with piperidine-loaded sieve (CW-1015) to a styrene rubber compound.

Curing Catalyst in Silicone Rubber

Chemical-loaded molecular sieve containing di-tertiary butyl peroxide (CW-2015) is an excellent curing catalyst in vulcanization of silicone rubber compounds based on vinyl-containing silicone gum stock such as Union Carbide W-96. The use of di-tertiary butyl peroxide as the catalyst gives low compression set values, allows thick section cures without tedious stepwise postcures, minimizes harmful catalyst residues in the rubber, and allows the use of carbon black as the reinforcing filler. The extreme volatility of this peroxide, however, has made it inconvenient to handle. Excessive loss of peroxide during compounding and storage requires almost immediate use of catalyzed stock in order to avoid having to recatalyze the batch. In addition, there is a fire hazard caused by accumulation of peroxide vapors above the mill during compounding.

It was envisioned that adsorption of this peroxide on molecular sieve would overcome these difficulties. After extensive study, it was found that when loaded on molecular sieves, the volatility of this compound was greatly reduced as evidenced by retention of the peroxide during bin aging and decreased fire hazard during compounding. It was also found that this peroxide was much more efficient as a cross-linking catalyst when adsorbed on molecular sieves. Lower concentrations were required than when peroxide was used alone.

Table I shows the effectiveness of the loaded sieve (CW-2015) in preventing catalyst evaporation during accelerated bin aging. Liquid di-tertiary butyl peroxide is completely lost in a period of two days, whereas essentially no loss of peroxide from the sieve-catalyzed compound had occurred even after 14 days.

Early in 1956 Union Carbide X-1960 Curing Compound, a white paste containing di-tertiary butyl peroxide-loaded sieve was introduced, and is now widely used by silicone rubber fabricators. This was the first commercial use of this loaded sieve which has made possible simplified and effective curing of large masses of rubber, including large silicone covered rolls for use in the textile, plastics and paper industries. In the molding of large parts, it allows a one-step postcure in place of a long scheduled step cure. In molding gaskets, its use is said to assure not only the lowest possible compression set, but also to minimize scorching and other fabrication problems.

Loaded Sieves in Plastics Formulations

Thermosetting plastics formulations generally have poor pot life and storage stability in the catalyzed state. Therefore, use of loaded sieve, in which an active component is isolated from the rest of the system during compounding and storage, results in considerable improvement in these processing characteristics. The use of curing temperatures which are high enough to release the adsorbed compound from the molecular sieve in an active form will then promote the curing reaction.

Many plastics formulations are processed at room temperature or slightly above. Therefore, a loaded sieve in which the adsorbed active compound is relatively volatile may be used and still be effectively isolated from the resin system during processing and storage. In some cases, catalysts or curing agents which cannot be conveniently incorporated into the system in any other way may be used. For example, ammonia may be used as a hardener for epoxy resins by adding ammonia-loaded molecular sieves.

Peroxide catalyzed thermosetting resins also, in addition to the plastics formulations, suffer from poor pot life and storage stability in the catalyzed state. This has often led to the marketing of many of these materials in a two-package system. The use of di-tertiary butyl peroxide loaded-sieve as the curing catalyst gives increased

TABLE I—ACCELERATED STORAGE LIFE OF DI-TERTIARY BUTYL PEROXIDE-LOADED MOLECULAR SIEVE-CATALYZED COMPOUNDS

			Mold Cured 20 Min. at 340°F.			Postcured 24 Hours at 480°F.				
Type	Conc. p./100 p. K-1035	Bin (days) Aged	Tensile (psi)	Elongation (%)	Hardness (Shore A)	Tensile (psi)	Elongation (%)	Hardness (Shore A)	Wt. Loss (%)	Compression Set (%)*
DTBP-liquid	0.6	0	940	310	43	980	210	51	7.5	14
DTBP-liquid	0.6	2	Did not cure							
Di-tertiary butyl peroxide-loaded molecular sieve (CW-2015)	3.1	0	990	300	44	1000	220	51	6.9	12
Di-tertiary butyl peroxide-loaded molecular sieve (CW-2015)	3.1	14	1080	320	45	1030	230	48	5.8	15

Compounds bin aged in the catalyzed state; Union Carbide Silicone K-1035 used throughout. *Method B, 70 hours at 300°F.

TABLE II—EFFECT OF VARIOUS CATALYSTS ON GELATION OF POLYETHYLENE GLYCOL DIMETHACRYLATE

Catalyst	Concentration of Catalyst (Wt.-%)	Temperature (°F.)	Time of Formation of Gel
Di-tertiary butyl peroxide-loaded sieve (CW-2015)	5.0	122	> 15 days
Di-tertiary butyl peroxide-loaded sieve (CW-2015)	5.0	210	> 8 hours
Di-tertiary butyl peroxide-loaded sieve (CW-2015)	5.0	350	5 minutes*
Luperco ATC**	1.5	122	< 5 days
Luperco ATC	1.5	210	> 20 minutes
Luperco ATC	1.5	350	5 minutes*

*Hard resin obtained; **50% dibenzoyl peroxide in tricresyl phosphate.

TABLE III—POT LIFE OF POLYVINYL CHLORIDE PLASTISOL CONTAINING MONOMER MG-1 AS PLASTICIZER

PVC Resin (grams)	MG-1* (grams)	DTBP** (grams)	Di-tertiary butyl peroxide-loaded molecular sieve (CW-2015) (grams)	Viscosity at 30°C. (Poise) 1 Day	4 Days	7 Days	14 Days	20 Days
100	60	1.8	—	59	103	Gel	—	—
100	60	—	12.2***	60	145	209	295	Gel

*Polyethylene glycol dimethacrylate; **Di-tertiary butyl peroxide; ***Equivalent to 1.8 grams DTBP.

storage stability and should allow the use of one-package systems in many cases.

Table II shows that addition of a curing peroxide such as benzoyl peroxide to polyethylene glycol dimethacrylate (Union Carbide Monomer MG-1) will cause this material to gel in less than five days at 122°F. and in less than 20 minutes at 210°F. When di-tertiary butyl peroxide loaded-sieve (CW-2015) is used as the catalyst, however, there is very little change in this material after 15 days at 122°F. or after eight hours at 210°F. Both catalysts, however, result in formation of a hard resin after five minutes at 350°F. These data show how effectively the peroxide is isolated from the system by the molecular sieve at temperatures up to 210°F. Release of the peroxide from the molecular sieve at 350°F., however, allows it to function in its normal manner.

Monomer MG-1 can be used as the sole or partial liquid component in plastisols with vinyl chloride resins. Plastisol compositions of unusual hardness, dryness and strength can be made utilizing this material if a peroxide is used to catalyze its polymerization during fusion of the plastisol. However, one of the problems of plastisol formulators is storage stability or pot life at or near room temperature when plastisols containing this polymerizable diester are catalyzed with a peroxide. Table III shows that the use of the di-tertiary butyl peroxide-loaded sieve, (CW-2015) as the catalyst extends the storage stability of this type plastisol considerably over that obtained using liquid di-tertiary butyl peroxide. In addition, if vacuum deaeration of the plastisol is used, pure di-tertiary butyl peroxide is lost due to its high volatility.

Coming Next Month...

Properties of Fluorocarbon Elastomer 214—By Angus Wilson, C. B. Griffis and J. C. Montermoso, Quartermaster Research and Engineering Center, U. S. Army, Natick, Mass.

Evaluation of the chemical resistance and thermal stability of a new elastomer as influenced by peroxide, amine and HMDA Carbamate curing systems.

Automatic Custom Molding of Rubber Parts.

Description of a completely automated process for high precision, high volume custom molding of rubber parts recently placed into full operation by Ohio Rubber Co. at its Stratford, Conn., plant.

Compounding for Heat-Resistant Insulations and Jackets—By A. C. Rowley, R. T. Vanderbilt Co., Inc., New York, N. Y.

Results of compounding studies of butyl rubber and styrene rubber for insulations, and of neoprene for jackets.

Abstracts of Papers to be Presented at the Fall Meeting of the Division of Rubber Chemistry, A.C.S.

Complete abstracts of all the papers to be given at the meeting in Chicago, Ill., September 10-12.

PLUS A R/A SPECIAL INDUSTRY REPORT

Business Failures Among Rubber Manufacturers.

A study prepared by Dun & Bradstreet on bankruptcies in the rubber industry, with comparative figures for 1956, 1957 and 1958 and a breakdown on the reasons for the failures.

A file system used for

Handling Sales Records of

Advantages include a complete picture of sales activity on an almost day-to-day basis

THE principle of survival for any established company in this age of rapidly accelerating technological growth is to know not only where it is going, but how it is going as well. This rather simple premise has an unusually strong application to American Latex Products Corp., which was formed in 1946 to manufacture foam rubber. To meet competition, which included some of the most powerful corporations in the United States, the firm evolved a formula which was to make the company the West Coast leader in its field.

The formula: a marriage of aggressive salesmanship with scientific research. Salesmen, chemists and engineers worked together to design a product—C-Foam—calculated to effect large savings in production time and labor for manufacturers as well as greater sales appeal for their customers.

Salesmen, thoroughly imbued with a "hard sell" philosophy, maintained a pace that quickly made the West Coast area the largest user of foam rubber in the nation. Ranging afield, company chemists tackled foam rubber scrap reclamation and produced Moltex; researched the foamed polyurethane plastic and came up with Stafoam; and entered the industrial adhesives field with various formulas of Stabond. These new products were added to those handled by the sales staff.

In the company's period of rapid growth there was little time—or need—for reflection, or sales analysis. But there came a time when it was necessary for the company to know how it was going.

Files and sales records were scattered throughout several departments. Management was hard pressed to keep a balance between sales and production. Salesmen were finding it increasingly difficult to ascertain if they were progressing, falling behind or just standing still. Neither did they have a comparison of their own work with current sales activity.

This situation called for the installation of a system that would provide management with the means of obtaining a mass of facts about a myriad of accounts buying a score of products, quickly and accurately. After a good deal of study, Remington Rand's Kardex system, with a few innovations to make it more effective in the organization, was adopted. The new system has already made itself felt, even though it has only been in use for a short time.

The greatest advantage is that the company now has a complete picture of sales activity on just about a day-to-day basis. The information is quickly available both to management and to the sales force. As a matter of fact, one of the "new wrinkles" is that each salesman carries his own particular copy of the over-all system with him, in miniature.

The American Latex Products sales offices are located in Los Angeles, San Francisco, Seattle and Dallas. A force of 21 men handles sales west of the Mississippi; the rest of the nation is covered through agents. Also sold indirectly is the one end item made by the company—office chair cushions—which is handled by distributors and retailed through stationery stores.

Ten salesmen work out of Los Angeles alone, which is by far the most important single office. It was decided to use this territory as a pilot in revising methods to increase sales coverage. In the past, the men were free to solicit business anywhere within the area. One of the first objectives, therefore, was to assign equitable territories to each salesman, to insure saturation coverage.

This, of course, introduced the usual ticklish situation; no one likes to think that a revision of operating methods will hit him in the pocketbook. One of the major reasons for adopting the Kardex system was to prove, easily and quickly, that the assignment of a specific territory would not reduce a man's income; that as a matter of fact, it held out on an excellent potential for improvement. This can only be done through accurate figures, available when needed, in a form that can be easily grasped.

It was also recognized that any sales control system is no better than the information it contains. A great amount of this, of course, must come from the salesmen. However, salesmen are notoriously poor reporters unless management rides hard on them. Even then the point can be reached where salesmen submit large numbers of reports padded with meaningless information merely to "keep the old man happy."

By LEWIS C. PAPE
Sales Manager, American Latex Products Corp., Hawthorne, Calif.

Rubber Products

The one item of paperwork the salesman is painstaking about is his expense account. The Kardex system as used by American Latex Products, therefore, combines it with a specially designed and printed report form. As a salesman makes out his expense voucher he must also include the name and address of contacts made, the amount of merchandise sold under each product line, whether the contact is a new account or a prospect, whether there had been a mailing on it, and whether he is to call back. This data is posted to the record, where it helps provide an up-to-date picture on all accounts.

Design of the Equipment

The Kardex equipment uses overlapping pockets, with the bottom edges always visible for fast reference. The file is set up alphabetically by customer. In the title insert, which shows through the visible edge, is the customer's name, address and phone number. On the right-hand side is a printed scale. Later, when they are needed, two movable Graph-A-Matic signals will be used over this scale, one to show projected sales and the other actual sales.

The card in the bottom portion of the pocket lists sales by product classification. The left-hand side carries information such as date and shop order number. On the right are listed major products. As each order is posted, the clerk simply indicates the order data, and the amount under each appropriate product heading.

The upper pocket contains two cards. One is a monthly summary of sales, again by product line. It provides for an estimate of annual purchases by the customer, so that as the monthly summary is accumulated it is possible to check against the projected sales to see how the two compare.

The second card is a summary of sales on a yearly basis, with space to accommodate a five-year history. It also contains the name of the buyer, his title, competition on the account, and the reasons if one is favored. Additional information includes the maximum credit limitations, the name of the salesman on the account, and any other relevant data.

The copy of this system which each salesman has in miniature is a Kardex Book Unit, a replica of headquarters records covering his accounts. In addition to helping him in his own work, the Kardex Book Unit enables him to see the value of planned, systematic effort. He has the complete picture needed to do an effective job.

One clerk, spending about half her time, is now able to keep all information pertinent to the Los Angeles sales of American Latex Products Corp. in a single, ready-reference source. The system pays for itself merely by time saved in searching through other sources of information for data used in day-to-day operation of the company's sales activities.

In the future, sales projections will be based on facts quickly and easily available. If a salesman is not performing as well as he should, it will be discovered soon enough to do something about it. If a trend towards fewer sales of any given product is noticed, the company can immediately check the possibility that new advances threaten its utility. If sales experience shows that projections were overly optimistic, production can be scaled down accordingly. By the same token, a healthier-than-expected sales volume will indicate that production plans may be inadequate.

Three Kardex cabinets house all customer records with adequate room for expansion. Posting is quick and simple, reducing clerical effort to a minimum. The system provides a high degree of flexibility; if it is necessary to add more signals in the future, redesign the cards to include other data, or make any changes to increase their utility, revision will be a simple matter. It is a system designed to grow with the user, and from what American Latex Products can see at this point, it will do exactly that. Above all, it is providing the kind of tight control needed to give true meaning to the phrase "Sales Management."

Questions and answers on

Statistical Quality Control

in the rubber industry

What Akron Rubber Group members asked about an increasingly important factor in manufacturing operations

A SYMPOSIUM on "Statistical Quality Control in the Rubber Industry," presented before the Akron Rubber Group at its January 24th meeting, featured five experts who spoke on various phases of the subject. Their addresses were printed in full in the May issue of RUBBER AGE. The speakers were: E. M. Bader, Manager of Quality Control, B. F. Goodrich Aviation Products, Akron, Ohio; J. N. Berrettoni, Chairman, Department of Statistics, Western Reserve University, Cleveland, Ohio; Donald L. Dewing, Director of Quality Control, General Tire & Rubber Co., Akron, Ohio; L. A. Bedford, Manager of Quality Control, Chemical Operations, Goodyear Tire & Rubber Co., Akron, Ohio, and F. J. Newton, Manager, Standards and Methods Department, Quality Control Office, Ford Motor Co., Detroit, Michigan.

After presenting their papers, the speakers answered questions submitted by the members of the audience. What the listeners wanted to know and how the experts answered follows:

Question: How is SQC applied to the large rubber fabric calender?

Answered by Mr. Bader: One of the first operations to be studied for possible application of SQC by most of the rubber companies was the large volume calenders. Although the struggles were long and hard no one met with signficant success. The failures were not because of inadequate statistical methods. Instead, they were caused by inadequate devices for measuring thickness of the calendered material while the equipment was running. A few years ago new measuring devices, such as the continuous recording beta ray gage, were developed. Once these devices were installed on calenders the measurement problems almost disappeared. In fact, these devices do such a thorough job of measurement and data reporting that, to my knowledge, other control procedures are not being used.

Question: There are usually differences of opinion between producers and consumers regarding acceptable limits of materials. Assuming statistical quality control procedures eliminate arbitrary standards, how are these differences resolved, referring to two sigma and three sigma limits?

Answered by Mr. Newton: Normally our specification limits on the blueprint fall within a three sigma limitation. However, this is not necessarily true in all cases, and limits closer than three sigma are indicated by design limitations rather than by process capability. In those cases where narrower limits are required, they are usually part of the purchasing agreement, but are not spelled out as such.

The blueprint is the "bible" as far as specifications are concerned and, of course, is the integral part of any purchase agreement. Therefore, in bidding on the job, the vendor should consider the ability of his process or equipment to produce parts within the specified limits on the print; and if these limits are too close for his normal process capability, then it would logically be assumed that, in order to meet the requirements of the blueprint, closer controls would have to be maintained, and perhaps a higher asking price for the product demanded. This could be carried to an extreme, where the limits would be so close that it would be necessary to produce parts in a tool room for specific applications, and that normal production equipment would not be capable of producing within the tolerances specified.

Question: What advantages are there in using statistical techniques for development problems?

Answered by Mr. Dewing: Probably the chief advantage lies in the use of statistically designed experiments to replace the trial and error (one variable at a time) approach in determining design specifications and tolerances and in planning test programs to evaluate the design versus the design objectives. The knowledge of process capabilities is also very useful to the design engineer in the establishment of tolerances. In development problems where the number of variables and the

experimental error is large, I do not know of any method of determining cause and effect relationships without the use of statistical methods.

Question: What statistical methods are recommended for checking the uniformity of synthetic rubber as received?

Answered by Mr. Bedford: One of the most developed fields of SQC is acceptance sampling. Acceptance sampling provides a procedure for determining the number of samples required to give the quality assurance you wish to have. Mr. Bader, our moderator, has done some very good work for ASTM in the field of synthetic rubber sampling. Most quality control reference books and the monthly magazine *Industrial Quality Controls* have chapters and articles on "Acceptance Sampling by Variables."

Question: To whom should the central SQC manager report?

Answered by Dr. Berrettoni: A company is obligated to deliver the "quality" purchased by a customer. This obligation is truly recognized when the quality function is placed on the same organizational level of recognition and authority as sales, production, cost, etc. Thus, the central SQC manager should report to a vice-president or president.

Question: How much is saved in testing man-hours by adopting SQC compared to pre-SQC operations?

Answered by Mr. Bader: If the sample size and therefore testing man-hours were determined by some method other than statistically, it would have to have been an entirely arbitrary one. SQC can determine the correct amount of testing hours to obtain test results to a required level of accuracy. An arbitrary method will either require more or fewer testing hours. If fewer hours are used, they are wasted because they will not provide "accurate" results. There is no general pattern to arbitrarily determined sampling plans in the rubber industry.

Question: How is sample frequency determined?

Answered by Mr. Newton: In receiving inspection, the frequency is determined, as pointed out previously, by the performance history of the supplier, or by the performance history of similar parts by other suppliers. In many cases, manpower limitations dictate sample frequency, and different frequencies are established for routine inspection, laboratory inspection and layout inspection. In manufacturing areas, however, frequencies are established generally on the basis of the stability of the process and the frequencies with which the job settings are made, i.e., the assignment of operators, variation of stock, etc. The most important thing, however, is that the frequency pattern be set so that it includes all of the factors involved which contribute to the quality of the part.

Question: How is SQC applied to rubber molded goods?

Answered by Mr. Dewing: The techniques used in order control, design control, incoming material control, outgoing product control, and field performance are approximately the same for rubber molded goods as for any other product. However, the techniques used in in-process control depend upon the product and the method of manufacture.

An example of a quality control program established for molded rubber goods in one of the General Tire plants is as follows: Process control charts are maintained for each mold. Samples are taken at start-up and at periodic intervals thereafter and the data plotted on X and R charts. As long as the process stays in control at a satisfactory level, the process proceeds. If the charts get out of control, the mold is shut down until the problem is corrected. Operators have two boxes, one for the obvious defectives found at stripping and one for the remainder of the products. The last operator puts the product into a shipping box. Mil-Std samples are taken on shipments prior to shipment. If the quality record permits, the amount of final sampling can be greatly reduced. This system has resulted in better quality product, less scrap and defectives, and has eliminated the 100% packers and inspectors.

Question: Are there any SQC techniques which will select the proper test to be used for control of rubber materials?

Answered by Mr. Bedford: In general, the "proper test" would be the one which most precisely measures the use requirements. Multiple correlation techniques might be used to determine which of three or four tests is the best. The concept of sensitivity is important in selecting the proper test. This idea is discussed by Mandel and Stiehler in an article in *ASTM Bulletin* for February, 1955 entitled "Statistics — A Tool in Testing Rubber."

Question: Can an SQC department head be an enginer or chemist with an interest in but without formal training in statistics? If so, of how much value is help obtained from a consulting statistician?

Answered by Dr. Berrettoni: An SQC department head can be an engineer or chemist with an interest in but without formal training in statistics. With this background, he would be expected to be an administrator, and, in this capacity, to build a reputable department by hiring competent personnel to carry out the statistical quality control functions. A statistical quality control consultant would be of invaluable assistance for guidance in direction and emphasis.

Question: In controlling Banbury mixing operations, is it necessary to test every batch?

Answered by Mr. Bader: It is traditional in the rubber industry to test every batch after mixing on a mill or in a Banbury. This is not always necessary. Depending on the current performance of a specific compound there are short periods during which tests need to be performed only on an intermittent basis. The only problem is how to identify these periods and what should be the frequency of the intermittent tests. There are

two general types of sampling systems that can provide this information: continuous sampling and sequential sampling. Either one of these systems will provide a sampling plan that will automatically switch back and forth between one hundred per cent testing and intermittent testing as conditions warrant.

Question: What problems are involved in applying SQC to a relatively small number of units, and to an extremely large number of units?

Answered by Mr. Newton: Statistical quality control is easy to justify on production runs where the number of units is large, inasmuch as the cost per piece becomes relatively insignificant. One of the problems which must be guarded against, however, is found where the same part is made on more than one production line or set-up. In this case, care must be taken to be sure that it is possible to identify the product from each individual set-up or production line, in order that an evaluation may be made of the production from each. If a random sample is necessary and desired, the sample size must be sufficiently large to assure that the sample is random. In applying statistical quality control to a relatively small number of units, the problem becomes more difficult, inasmuch as the relatively small size of the production results in significantly higher cost per unit for the inspection. In small size lots, there is danger of using a sample size which is not large enough to discover defective parts representative of the lot.

Question: How wide should limits be set for green rubber stock dimensions and how are they established?

Answered by Mr. Dewing: Limits may best be established by making a statistical analysis of all the variables which affect the stock dimensions. The total variance of a number of independent variances is equal to the sum of all of the individual variances. Using this formula the over-all tolerances or the tolerances of any individual operations may be determined. For example, the length of tire treads is determined by variations due to the rubber stock, extrusion temperature, shrinkage during cooling, the cut-off machine, handling, etc. The total variance to be expected in over-all length of treads is the sum of these individual variances which would be the limits for tread length. If the over-all limits are not satisfactory special investigations would have to be made to reduce the individual variances as required.

Question: Describe how SQC is actually put into practice in a physical testing laboratory?

Answered by Mr. Bedford: The periodic testing of standard samples by each of the laboratory technicians is an excellent starting point. The day-to-day test results on the standard samples can be used to determine test accuracy and precision and to find which technicians require further training. Plotting the standard sample results on a control chart will keep the test in control. A test method in reality is a miniature process with raw materials, equipment, and technicians as the variables. The effect of each of these variables on the uniformity of the final test results can be determined and the test method improved accordingly.

Question: Should the manager of SQC be also in charge of production inspection?

Answered by Dr. Berrettoni: Production inspection usually means the automatic and continuous inspection of one or more dimensions during the production cycle. It is 100% inspection with the added feature that production of acceptable parts is impossible without inspecting and producing simultaneously. For this reason, production inspection should be in charge of production rather than SQC. It is a production function.

Question: How important is SQC in the rubber industry relative to other industries?

Answered by Mr. Newton: Statistical quality control should be as important in the rubber industry as in any other. This industry combines processes involving batch-type application, as well as the production of individual units in the congregation of material into lots. Proper use of statistical quality control should assist the rubber industry in the development of the art into a scientific process. A variety of statistical quality control techniques, such as control charts, sampling plans, capability studies, and scrap analyses, could be applicable to this industry, and would assist in the maintenance of high quality products.

Question: Why not use a quality assurance inspection on finished tires rather than 100% inspection?

Answered by Mr. Dewing: I assume by quality assurance inspection we mean some sort of sampling plan. Finished tires could be accepted on the basis of a sampling plan provided the process can be controlled to the extent that tires reaching the sampling station meet the acceptable quality level. If the per cent defective reaching the sampling station is high, a sampling plan would only reject it for 100% screening which, of course, would be of no benefit. A continuous sampling plan has been initiated on tires at General Tire in order to control the quality of outgoing products. However, the 100% conveyor inspectors have not been eliminated nor can they be until the process is controlled at an acceptable quality level.

Question: Are there any logical places to start using process control in chemical production?

Answered by Mr. Bedford: It will be different for each company and each product. Begin with a survey of scrap, rework, and product quality problems. It will be found that a disproportionate amount of waste costs and quality problems come from only a few sources. Select the department, product, and product defect which is

causing the greatest dollar loss. Then, with the use of statistical tools and the knowledge of all concerned, determine the process variables related to this critical defect. Controls on these variables will yield the greatest benefits and is therefore the best place to start.

Question: Is it desirable to have an SQC representative contact customers in case of complaints on quality of product?

Answered by Dr. Berrettoni: It is more than desirable to have an SQC representative contact customers in case of complaints on quality of product. It is mandatory. The SQC man should have first hand information about quality complaints in order that he may appraise these complaints in terms of quality acceptable standards of AQL's, majors, minors, defects versus defectives, variable sampling versus attribute, etc. However, at all times, customer contact by the SQC man should be cleared by the sales department. This is organization etiquette.

Question: How much is "Certification by Vendor" used by companies?

Answered by Mr. Newton: Vendor certification of a formal nature has a very limited application at Ford Motor Co. because it has not entirely accomplished its primary purpose, i.e., the resolving of quality problems on those parts which historically have been chronic. Moreover, it has emphasized the high quality of parts which consistently have been excellent. In this light, vendor certification leaves something to be desired, but it has benefits for both consumer and supplier which have not been fully realized. Actually, where inspection is waived on a part because of an exceptional quality record, this is vendor certification of an informal nature. Price, delivery, and other factors being equal, vendor certification can facilitate purchasing responsibility in the continuing search for quality suppliers.

Question: Most SQC charts seem to be based on the average and standard deviation of two or more tests on the same sample. Can SQC charts be set up satisfactorily on the basis of a single test per sample?

Answered by Mr. Dewing: Control charts may be set up satisfactorily on the basis of plotting individual tests provided that the distribution of individual values are reasonably close to a normal distribution, since control charts are based upon a normal distribution. However, average charts are usually more desirable since a distribution of averages tends to be normal although the individual values are not. If the question refers to the number of tests that should be required, this is a different problem. The number of tests is a function of the test error involved and in cases where you have a sizable test error, one test per sample would probably not be sufficient. The larger the number of tests, the smaller becomes the risk of accepting a lot of material outside of specification or rejecting a lot which is within specification.

Question: What are the advantages or disadvantages of spot samples versus composite samples from a process stream?

Answered by Mr. Bedford: Spot samples reveal instantaneous quality. Composite samples give average quality. The problem and objective will determine which to use. If duplicate tests are to be run on a composite sample, it will usually be found advantageous to run single determinations on two samples, if sampling costs are low. If the process is in control the quality variation (uniformity) will be constant. Cost of testing can then be reduced by making one analysis on a composite of several samples rather than analyzing each sample.

Question: How can management and production be convinced of the usefulness of SQC techniques?

Answered by Dr. Berrettoni: Coordinated effort among statistical quality control, engineering, purchasing, production control, production, finance, industrial engineering, management, etc., is vital for a healthy and prosperous company. The newcomer to the list is statistical quality control. A company will add SQC to the list only when SQC shows that it has a value added of its own and when SQC realizes that this value added could not be obtained without the cooperative effort of all other functions. The necessity for convincing management, production and others soon disappears.

Question: To what operations in tire manufacturing has SQC been applied successfully?

Answered by Mr. Dewing: Statistical quality control at General Tire is quite new and although statistical applications have been started in many areas, the success of the programs has not been clearly determined. However, reasonable success has been obtained in the following: (a) Planning and evaluating of experimental test programs to evaluate design changes prior to production, (b) Determining process capability of tubers, calenders and other processes, (c) Sampling of incoming materials, (d) Improvement of product and process specifications, (e) Acceptance of camelback by variable control charts, and (f) Solving of product and quality problems by use of designed experiments.

Answered by Mr. Bedford: SQC has been applied successfully in practically all operations.

Question: How much is "Certification by Vendor" used by rubber companies?

Answered by Mr. Dewing: General Tire intends to use raw material certifications insofar as practical. We have started by getting certifications for material and products shipped between the several plants of the company and have only recently started certification of outside vendors.

Answered by Mr. Bedford: Our vendors agree that their materials will meet the purchasing specification requirements. The submitting of certificates of compliance and analysis, including actual test results, by vendors so that complete testing of every shipment by our laboratory is unnecessary, is being studied. At the present time very few of our chemical materials are accepted based on certification.

Editorials..

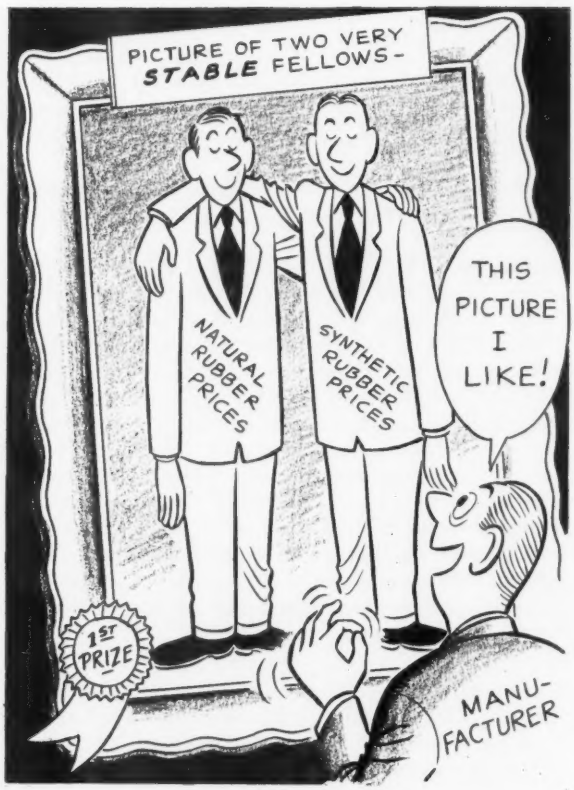
Price Stability

► Along with the technological advances which accompanied it, and the military necessity which dictated it, the advent of synthetic rubber was hailed by the rubber manufacturing industry for the price stability it heralded. Any manufacturer of rubber products whose history goes back more than twenty years well remembers the one frightening aspect in his economic picture, namely, the constant rise and fall of rubber prices. Millions of words have been written on this subject and they require no repetition at this point. What we do want to emphasize is that the price of synthetic rubber has been relatively stable at or near 23 cents a pound—whether under government supervision or in the hands of private industry.

In the general jubilation over the price stability of the synthetic material the fact has been overlooked that natural rubber, too, has achieved a stability remarkable for a commodity whose previous history was all peaks and valleys. This was brought home sharply in a recent issue of *Natural Rubber News,* the monthly newsletter issued by the Natural Rubber Bureau. This new-found stability covers production, consumption and price.

The Bureau makes these three points: (1) The 1957 *production* of natural rubber amounted to 1,935,000 long tons, which varies less than one per cent from the 1955 production of 1,922,000 tons and 1956 production of 1,940,000 tons; (2) The 1957 *consumption* of natural rubber amounted to 1,880,000 long tons, which was almost exactly equal to the 1955 rate of 1,882,500 tons and only two per cent less than the 1956 peak of 1,920,000 tons; (3) The *price* of natural rubber during the past three years showed considerable variation, but for the past full year the range has been within 4 cents either way of the 30-cent mark.

The Bureau has also found evidence of stability in stocks and shipments. World stocks of natural rubber at the end of 1957 amounted to 752,500 long tons, which were exactly the same as at the end of 1955 and only slightly more than the 727,500 tons at the end of 1956. The conclusion is drawn that the world has settled down to producing and using about 1,900,000 long tons of natural rubber a year and to maintaining a stock of about 750,000 tons.



Whatever the conclusions, the rubber manufacturing industry will be glad to note that a commodity which has given them such economic headaches in the past is finally reaching a stability factor which can be utilized in planning and programming. It is not important whether or not the advent of synthetic rubber was responsible for this growing stability. The importance is in the stability itself. Long may it continue!

Special Industry Report

EMPLOYEE FEEDING

How rubber companies handle a basic operational problem

LIKE the rest of American industry, rubber and rubber product companies are moving toward in-plant feeding but on a somewhat smaller scale, according to a survey of 28 rubber companies and 1,250 other industrial organizations, recently completed by the Field Research Division of the Paper Cup and Container Institute.

In line with over-all industrial practice, nearly half of the rubber companies responding serve food in their plants. Reasons given are: the lunch period is too short to permit employees to leave the building; there are no nearby outside facilities, or it is simply company policy to do so. Because the rubber industry's lunch periods for shop workers on the average appear to run somewhat shorter than those in other industries and a high percentage of workers bring lunches from home, the companies in the industry might be expected to provide more supplementary feeding facilities than most other companies. Actually, rubber companies provide less.

Most of the difference lies in the rubber industry's relative slowness in utilizing vending machines which have risen rapidly in general use in U.S. plants in the past 10 years. Some lack of knowledge in the rubber industry of their advantages is suggested by the fact that the majority of rubber companies that use them not only gain the morale benefits reported by other industries, but state that the machines produce profits of $300 to $25,000 annually.

Survey Based on Representative Plants

The basic data for the survey was obtained by mail questionnaires addressed to a total of 4,976 industrial plants. These were selected so as to be representative of American industry in terms of type of product, gross annual dollar volume, geographic distribution and number of employees. Although plants with less than 250 workers represent 96% of U.S. manufacturing establishments, they were not given entirely proportionate weight in the survey because so many of them are highly specialized operations employing less than 50 people.

Replies were received from 1,277 plants in 37 states. Sizes of plants represented are indicated below:

Size of Plant by Number of Employees	Number of Plants	Per Cent of Respondents
Less than 250 people	560	44.3%
250-499	283	22.4%
500-999	218	17.2%
1,000-2,499	135	10.7%
2,500 and over	68	5.4%
Total respondents less 13 plants not stipulating size	1,264	100.0%

Distribution of responses from the rubber industry paralleled those of industry in general.

The decision as to whether or not employees should be offered food service seems to depend throughout industry upon size of plants as much as any other factor. The larger the plant, the more likely it is to provide food facilities. This development has gone so far that almost all plants with more than 1,000 employees have food service now and 26% of these plants are planning to expand feeding facilities in the next two years; 39% report having made such expansion within the past two years. Plants in the 250 to 500 employee category have been most active in recent expansion. The breakdown is shown in Table I.

Rubber companies are apparently becoming more active in this field. Only 46% at the time of the survey reported that they fed their employees as compared with an all-industry average of 55%, but expansion of facilities in past years has run at about the same rate as industry generally. And those rubber companies now having feeding facilities more frequently have plans for expansion than companies of the same size in other industries.

About half of the workers in rubber factories bring their food, a higher proportion than is found in industry generally. Many rely on management for such items as ice cream.

Why Factories Offer Food to Workers

The reasons for offering food to factory workers appear to fall into three major classifications. Number 1, with 50.2% making the statement, is company or plant policy. It can be assumed that this was a management decison, since only 1% reported that their union contract required food service.

The second reason for providing food service, reported also by almost 50% of respondents, is lack of restaurants and cafeterias near plants, a factor that may increase in importance as plants move away from urban areas. Reason number 3 is related to another trend in industrial practices, "Lunch period too short to leave the building," a statement given by 44.7% of plants.

For both office and shop workers, the half-hour lunch period is apparently be-

TABLE I—PERCENTAGE OF PLANTS WHICH OFFER FOOD SERVICE BY SIZE

	Number of Employees			
	Under 250	250-499	500-999	Over 1,000
Provide food service now	30.8%	63.1%	74.8%	91.1%
Plan to provide soon	2.0%	2.5%	.9%	1.5%
Expanded in past two years	32.2%	45.6%	37.4%	39.0%
Plan to expand in next two years	10.8%	13.4%	21.6%	26.2%

Generally smaller plants make more frequent use of vending machines than those with 500 or more employees, though they have won an acceptance in most for refreshment breaks.

coming the norm in manufacturing plants. As indicated in Table II, a survey made in 1950 by the Paper Cup and Container Institute showed that 69% of plants had half-hour lunch periods for shop workers. In the present survey the figure had risen to more than 82% of plants reporting. For workers in factory offices, the trend has been in the same direction, with 41.5% of office workers now on a half-hour schedule compared with 31% in 1950. (Percentages are based on 226 plants in 1950 and on 668 plants in this survey.) The lengths of lunch periods in 1950 and now are given in Table II.

Present lunch periods reported by rubber companies suggest that there may be an unfilled need for additional supplementary feeding facilities for shop workers. While workers in plant offices have lunch periods that parallel those of industry in general, shop workers' lunch periods are shorter than average, and this is the number one reason given for feeding by rubber companies now offering this service. The lengths of lunch periods given by rubber companies are:

15-20 min.	30 min.	45 min.	1 hour
	For shop workers		
41.6%	50.0%	0.0%	8.4%
	For office workers		
0.0%	38.4%	23.2%	38.4%

From 20% to nearly 100% of workers at the various rubber companies that feed bring their own lunches; the rule appears to be that about half of the workers bring their own food, a higher proportion than that found in industry generally.

Increasing Use of Vending Machines

Analysis of the types of food service offered by U.S. industry shows a new and wide use of vending machines. Back in 1950 only 171 of 240 reporting plants used these machines. In the present survey 580 out of 695 plants were using machines more than any other kind of service. Thus, while more people are probably still fed in cafeterias, and cafeteria menus are undoubtedly broader, almost 84% of respondents said vending machines are used in their plants for serving food or beverages. Clearly, these machines are offering supplementary services since many of these plants also had cafeterias, canteens or mobile food units. For example, of 382 companies operating cafeterias, 308 also used food vending machines. Feeding facilities by size of plant with 639 plants reporting are tabulated in Table III. Percentages total more than 100 because some plants have more than one facility.

Reports from the rubber companies are in very close agreement with these figures except those concerning vending machines. Only 72% of the companies of the industry have vending machines as compared with the national average of nearly 84%.

Generally, smaller plants make slightly more frequent use of machines than those with 500 or more employees. This is to be expected because the machines make it possible to feed comparatively small groups of people at a reasonable cost. Not more than about a quarter of the plants with less than 250 people can afford to maintain a cafeteria with consequent space, staff, purchasing and other problems. Yet in the larger plants with their elaborate facilities, 76% also have vending machines. Interviews indicate that the machines have won a place for themselves for refreshment breaks and feeding night shifts.

Although automatic merchandising equipment for food has been available since well before World War II, nearly 40% of U.S. plants now using them started to do so for the first time during the past five years. Fifty-three per cent of those reporting expansion of facilities in the past two years said they added vending machines, and 26% who had introduced new installations in that period had put in machines.

There appear to be two main reasons for the increase in the use of automatic vendors. One is the increase in variety of foods and beverages which can be handled by the machines. At the close of World War II, plants offered on the average only 1.1 items through machines; now the average is close to four items. A good part of this increase has been the result of design progress; the development of a compact refrigeration unit which chills beverages and keeps food from spoiling; finding ways to use paper cups and containers to solve problems of sanitation, convenience and safety, and, recently, development of methods of heating foods.

The variety of foods now purveyed in machines is indicated by the tabulation of data from 580 plants:

Item	Number of Plants Serving
Soft drinks	572
Candy, nuts and gum	462
Coffee	268
Milk	219
Ice cream	164
Hot chocolate	76
Pastries and other baked goods	75
Fruit juices	57
Sandwiches	27
Soups	20
Fresh fruit (apples, etc.)	7
Potato chips	6
French fried potatoes	2
Stews or other made dishes	1

With the large proportion of soft drinks, candy, nuts and gum shown, it is easy to continue to think of machines as purveyors of only the lightest snacks. But a trend toward more meal-time foods can be seen in vending installations everywhere.

Briefly: Coffee has been the outstanding gainer since World War II, when only 3% of plants using machines made a practice of vending this beverage. By 1950, 20% of companies offered it. Within six years the figure had risen to 46%. Hot chocolate, virtually unheard of in 1950, is coming up also, with 13% of plants reporting that they now offer it through machines. Plants providing milk have doubled in 10 years; 18% of plants with machines sold it a decade ago. Thirty-seven per cent vend it now. Ice cream, starting like coffee in a very small per-

TABLE III—FEEDING FACILITIES BY SIZE OF PLANT

	Number of Employees				Per Cent
	Under 250	250-499	500-999	Over 1000	of Plants
Vending Machines	87.5%	84.2%	81.0%	81.6%	83.5%
Cafeteria	26.8%	42.9%	66.9%	81.6%	55.0%
Canteen or snack bar	14.3%	16.4%	14.1%	22.2%	16.8%
Mobile units or carts	23.2%	28.2%	26.4%	32.4%	27.6%
Other	7.1%	4.5%	3.1%	0.3%	4.5%

TABLE II—LENGTH OF LUNCH PERIODS IN MANUFACTURING PLANTS

		¼ hour	½ hour	¾ hour	1 hour
For shop workers	Now	4.5%	80.2%	5.1%	10.2%
	1950	11.4%	69.0%	8.2%	11.4%
For office workers	Now	0.8%	41.5%	19.2%	38.5%
	1950	1.8%	30.9%	21.7%	45.6%

centage of plants in World War II, was sold in 12% of plants with machines in 1950, and is now sold in 28% of plants reporting vended foods.

The growth of hot chocolate, partially stimulated by the fact that coffee machines are often designed to offer hot chocolate also, is a dramatic example of the trend toward greater variety of food service by machines. Other experiments are going on in many directions and some enthusiasts have predicted that complete seven-course meals are not far in the future. Whether or not they are too optimistic, it is true that new equipment is constantly being put on the market and that professional vending machine operators have reached the point where they are offering a variety of hot entrees.

Most plants, taking advantage of the small amount of space and of the simple mechanical arrangements required by vending machines, do not set up elaborate installations for the machines. About one plant in every four groups machines in batteries at "vending stations"; but most companies simply place them in working areas or in halls or in corridors where traffic is high. One or more of the following locations was named by 563 plants:

Locations	Number of Plants
Working areas	311
Halls or corridors	282
Stations of 2 or more machines	145
Special rooms with chairs and tables	56
Employees recreation rooms	47
Cafeterias	34
Other	7

In view of the fact that machines are usually placed within short distances of the employees' regular working stations, it is interesting to find that there is little restriction as to use—and without apparent bad results. Managers placing machines on the plant floors often insist on paper cup vending machines because they eliminate broken glass. But on the whole, machines do not require much policing.

TABLE IV—INCOME FROM VENDING MACHINES BY SIZE OF PLANT
360 PLANTS REPORTING

	Number of people employed in plant							
	Under 250		250-499		500-999		Over 1000	
Income per year	No.	%	No.	%	No.	%	No.	%
Under $100	18	20.4	6	6.1	—	—	1	1.1
$100-$499	51	58.0	37	37.8	25	30.1	4	4.4
$500-$999	12	13.6	27	27.6	16	19.3	11	12.2
$1000-$4999	5	5.7	25	25.5	37	44.6	46	50.5
$5000 and over	—	—	—	—	2	2.4	26	28.5
Unspecified	2	2.3	3	3.0	3	3.6	3	3.3
Total Respondents less "Not Stated"	88	100.0	98	100.0	83	100.0	91	100.0

Effect on Work Schedules

At one time it was feared that work would fall off as men gathered around the machines. Actually, there have been some startling stories of man-hours saved by the elimination of food peddlers from plants through the installation of machines. Of the 564 managers discussing the subject, 436 stated that they have no restrictions, and 121 follow a rule that machines can be used during lunch and relief periods, while only seven hold machines to lunch periods only. Managers allowing unrestricted use agree, by a margin of 4 to 1, that machines do not interrupt production.

Part of the success in vending with so little restriction probably lies in the fact that the machines are generally in public places. Interviewers in the plants observed that groups did not tend to loiter in front of the machines. In some plants there was a procession of workers pausing at the machines for a moment, but nearly everyone ate or drank rapidly and hurried back to his job.

According to many department managers, this is in distinct contrast with what happens when a man comes in during the day to sell coffee or other snack items. His arrival is an event, and the workers cluster around him without hesitation. An executive in LaGrange, Illinois, figures that in his plant of moderate size, he saves 500 to 800 man hours per month in using vending machines to replace one snack purveyor who used to move around the plant for an hour each morning.

The effect of unrestricted use of vending machines on production, as reported by 436 plant managers who do not restrict use, is as follows:

Does not disrupt production	312 (72%)
Disrupts production	79 (18%)
No reply	45 (10%)

Company managements can feed an amazing number of employees in a short time by staggering lunch periods. Pre-proportioned servings help to maintain a smooth flow of traffic.

The most popular arrangement for the operation of the machines is a direct contract with a vending machine operator. Nearly three out of four plants find it necessary to use more than one operator, and installations involving three or four vending organizations are quite common. Almost 10% of the plants report that they work with five or more of these companies. Some plant people volunteered the observation that they would prefer to deal with only one operator to lessen confusion and place responsibility on a single organization.

Ninety-one per cent of the plants using vending companies report that they receive a percentage of the gross receipts from the vender. Less than 10% state that vending companies pay nothing for the privilege of operating the machines.

Profits to plant operators from the machines frequently amount to more than $1,000 a year and were reported in two exceptional cases at $15,000 and $75,000. Estimates of income from the machines, by size of plant, are shown in Table IV. Since most companies do not plan to make a profit on employee food service, income from vending machines is used in one way or another to benefit the employees by more than 80% of plants reporting.

R. F. Dunbrook and R. H. Gerke

A.C.S. Rubber Division Meets in Cincinnati

May Meeting Features Presentation of Thirty Papers; Symposium on "High Temperature Resistant Elastomers"; Meeting of Twenty-Five Year Club and the Rubber Division Banquet

► Some 900 members and guests of the Division of Rubber Chemistry of the American Chemical Society attended the 73rd meeting of the organization held on May 14 to 16 at the Netherlands Hilton Hotel in Cincinnati, Ohio. The program for the meeting featured the presentation of thirty papers and included a symposium on "High Temperature Resistant Elastomers." In addition to the technical portion of the meeting, members and guests participated in the luncheon meeting of the Twenty-Five Year Club and the divisional banquet.

A highlight of the meeting was the showing of a motion picture on the use of high speed photography in the rubber industry. (A feature article on this subject appeared in our May issue). The meeting also featured the presentation of an award for the best technical paper delivered at the previous meeting of the Division in New York City in September, 1957.

Technical Sessions Divided

The technical program was divided into three sessions, each with a general theme. On Wednesday afternoon, May 14, the papers presented concerned themselves with "Urethane Rubbers, Latices, etc." R. F. Dunbrook (Firestone), chairman of the division, served as moderator of this session.

The following morning was devoted to Part I of the symposium on "High Temperature Resistant Elastomers." E. R. Bartholomew (Wright Air Development Center), organizer of the symposium, presided. The six papers which comprised this portion of the meeting were all invited.

The second part of the symposium, held on Thursday afternoon, May 15, was to have included five contributed papers. Only four were presented, however. W. P. Fletcher (BRPRA), who was to have presented a paper on "Natural Rubber Compounds for High Temperature Service in Air" which he co-authored with S. G. Fogg, was injured in an automobile accident and unable to appear. Two general papers were also presented at this session, which was presided over by E. N. Cunningham (Precision Rubber Products).

The final technical session on Friday morning, May 16, was devoted to "Vulcanization and Reinforcement." S. C. Nicol (Goodyear) presided. Abstracts of all the papers presented at the meeting appeared in the April, 1958, issue of RUBBER AGE.

Special attractions arranged for the ladies in attendance included a bus tour of Cincinnati with a stopover at the famous Krohn Conservatory and a boat trip down the Ohio River. A "Ladies Get-Together and Talk" room was also arranged.

Arrangements for the meeting were handled by the Local Arrangements Committee with E. N. Cunningham as chairman. He was assisted by F. W. Gage (Dayton Chemical Products), J. M. Kelble (Wright Air Development Center) and J. R. Wall (Inland Manufacturing) who served as vice-chairmen. The following members handled the activities noted: *Finance,* Don N. Bertke (Texo); *Ladies Entertainment,* Boris Sway (Texo); *Hospitality and Information,* W. F. Herberg, Jr. (Dow Corning); *Registration,* R. E. Wells (Precision Rubber Products); *Publicity,* Fred W. Gage; *Banquet,* J. M. Williams (Amsco Solvents); *Housing,* C. L. Zimmerman (Zimmerman Co.); *Program and Meeting Rooms, S. J. Miller* (DuBois). H. S. Karch (C. P. Hall) served as chairman of the Twenty-Five Year Club.

Arrangements Well-Handled

Those in attendance were in agreement that the arrangements for the meeting were particularly well-handled. The hotel facilities were good and the hotel officials cooperative. This was the fourth time that the Rubber Division had met in Cincinnati.

Approximately 130 members were present for the meeting of the Twenty-Five Year Club luncheon which was held on Wednesday, May 14, with Mr. Karch presiding. The first order of business was the observance of a minute of silence for those members who had passed away since the last meeting. These included R. L. Sibley (Monsanto-retired), H. Morton

(Rubber Latex Products), T. Maxwell, F. W. Frerichs (Cupples-retired), G. Balazs and J. J. Catterall (RMA).

New members of the Twenty-Five Year Club include Rolla Taylor and Dave Scott (Scott Testers) and Tom Edwards (Acushnet Process). George Kratz was honored as the member present with the most years of service (49), exclusive of those who had previously been honored. Mr. Kratz, now retired from the rubber industry, was presented with a silver money clip.

Mr. Kratz first entered the rubber industry in 1906 with the old Diamond Rubber Co. He graduated from Cornell University in 1912 with a B. Chem. degree and served with Diamond Rubber as a research chemist.

During his career, he was associated with the Norwalk Tire and Rubber Co., and the Falls Rubber Co., where he was president. From 1930 to 1942, he was in business for himself as a chemical consultant. From 1942 to 1945, Mr. Kratz was associated with the Rubber Reserve Co. From 1945 to 1947, he resumed his consulting practice. During the years in which he was active as a consultant, Mr. Kratz represented the General Latex & Chemical Corp. in the New York Metropolitan area. During his career in the rubber industry, Mr. Kratz contributed to the literature. He holds several patents. Mr. Kratz announced his retirement from the rubber industry in August, 1955. Since that time he has been operating Buck Greenhouses at Washington Court House, Ohio.

The luncheon meeting was addressed by C. A. Harrell, City Manager of Cincinnati, who officially welcomed the Rubber Division to Cincinnati.

Messrs. Wall, Gage and Kelble served on the Local Committee which handled arrangements for the Division meeting.

Business Meeting Held

The business meeting of the Division of Rubber Chemistry was held on Thursday morning, May 14, with Dr. Dunbrook presiding. Division members who had passed away since the last meeting were honored by a minute of silence. These included Henri Chauvin (Dominion Rubber), M. S. Kharasch (Chicago University), M. H. Laatsch, Jr. (Goodyear), J. Q. McGiffin (General Tire), and Mr. Sibley.

It was announced that the division now has 2,492 full members and 574 associate members. In total, this represents 110 fewer members than at the close of 1957 with most of the loss coming in the full member category.

Members next voted on a series of proposed amendments to the by-laws. It was voted that a member of the division shall automatically be awarded status as an "Emeritus Member" upon notification to the treasurer that he has reached age 65. An Emeritus Member will enjoy all the rights of membership without payment of dues, but he will not receive *Rubber Chemistry and Technology* or the "Bibliography of Rubber Literature." An Emeritus Member, however, has the privilege of remaining an active member upon payment of dues.

It was also voted that the business manager who handles division funds as well as the secretary, treasurer and the editor and business manager of *Rubber Chemistry and Technology* be bonded in amounts to be determined by the Executive Committee.

In order to provide representation on the Executive Committee in the absence of the secretary and/or treasurer, the members agreed that the chairman shall appoint, with the approval of the elected members of the Executive Committee, an assistant secretary and an assistant treasurer. In the event that the secretary or treasurer cannot attend a meeting of the division or of the Executive Committee, the respective assistants may, with the approval of the Executive Committee, serve in his place.

L. H. Howland (Naugatuck Chemical) has been named to serve as assistant secretary of the division while D. F. Behney (Harwick Standard) has been appointed assistant treasurer. A report on these appointments, as well as the appointment of B. L. Johnson (Firestone) as associate editor of *Rubber Chemistry and Technology*, appears elsewhere in this issue.

Another amendment to the by-laws approved by the membership provides that the membership now has the opportunity of making additional nominations, provided that these nominations are sponsored by at least twenty-five members.

In order to provide more editorial help for *Rubber Chemistry and Technology*, the members agreed to allow for an editor and four associate editors, subject to the approval of the elected members of the Executive Committee. All appointments are for one year and each shall serve until a successor has been appointed. In the absence of the editor, one of the associate editors selected by the editor or chairman of the division may serve at a meeting of the Executive Committee.

It was voted to change the title of the advertising manager of *Rubber Chemistry and Technology* to "business manager" and to provide him with an assistant business manager. It was also agreed that the editor, associate editors, business manager and assistant business manager absent themselves from Executive Committee meetings during any discussion of appointments to their offices.

Other Amendments Passed

A new amendment to the by-laws now provides that the vice-chairman of the division may appoint a chairman of a Local Arrangements Committee and select as many assistants as he deems desirable to conduct the meeting.

In order to streamline the operations of the Rubber Library sponsored by the division, the by-laws have been amended. Under the new amendment, the Rubber Library is supervised by a committee consisting of five members of the division each to serve for a five-year period with staggered terms to permit one new member each year. The committee will supervise and control all library functions. The division treasurer will attend committee meetings as an ex-officio member and the entire committee will be responsible to the Executive Committee.

The next order of business before the members was the nomination of members for officers and directors of the group.

E. H. Krismann, chairman-elect of the Rubber Division, looks on as past-chairman B. S. Garvey, Jr., presents the Best Paper Award to Hugh E. Diem.

The following members have been nominated for the positions noted: *Chairman*, E. H. Krismann (DuPont); *Vice-Chairman*, John Ingmanson (Whitney Blake) and William J. Sparks (Esso Research); *Secretary*, R. H. Gerke (U. S. Rubber); *Treasurer*, George E. Popp (Phillips Chemical).

The following nominees were selected from the various rubber groups to serve as directors for a two-year term (one from each group): *Akron*, H. J. Neimeyer (Firestone) and S. C. Nicol (Goodyear); *Boston*, B. H. Capen (Tyer Rubber) and A. I. Ross (American Biltrite); *Buffalo*, C. Schintzius (Hewitt-Robins) and E. F. Sverdrup (U. S. Rubber Reclaiming); *Chicago*, T. C. Argue (Roth Rubber) and H. D. Shetler (Chicago Rawhide); *Fort Wayne*, J. Dunne (United Carbon) and M. J. O'Connor (O'Connor & Co.); *Los Angeles*, C. E. Huxley (Enjay) and R. D. Sullivan (Shell Chemical); *New York*, W. M. Gall (Luzerne Rubber) and L. J. Radi (Interchemical).

Goodyear Medal to Patrick

It was also announced at the meeting that Dr. Joseph C. Patrick, discoverer and pioneer in the production of "Thiokol" oil-resistant synthetic rubber, had been selected to receive the Charles Goodyear Medal for 1958. A comprehensive biography of Dr. Patrick appears elsewhere in this issue.

Another feature of the 73rd meeting of the Division of Rubber Chemistry was the banquet which was attended by approximately 450 members and guests. Dr. Dunbrook presided at the banquet session and paid tribute to the Local Arrangements Committee. He also introduced those sitting on the dais. A highlight of the banquet session was the presentation of the Best Paper Award given to the authors of the most worthy paper delivered at the previous meeting of the division.

The award went to Hugh E. Diem, C. F. Gibbs and Harold Tucker of the B. F. Goodrich Research Center, Brecksville, Ohio, for their paper "Alkyllithium Polymerization of Isoprene." Dr. B. S. Garvey, Jr. (Pennsalt Chemicals), past chairman of the Division of Rubber Chemistry, presented a plaque to Mr. Diem who was in attendance. Similar plaques will also be awarded to the other two authors.

Members and guests present for the banquet were served a roast beef dinner and witnessed a program of entertainment.

The keynote of the technical portion of the Rubber Division meeting was the previously mentioned symposium on "High Temperature Resistant Elastomers," which was divided into two separate sessions. The first session, held on Thursday morning, May 15, consisted of six invited papers. E. R. Bartholomew, organizer of the symposium, delivered brief introductory remarks. The papers and their authors follow:

"Properties of Elastomers Up to 550°F." by F. M. Smith, Chemical and Physical Research Laboratories, Firestone Tire & Rubber Co., Akron, Ohio.

"Viton—Heat and Fluid Resistant Elastomer" by W. V. Freed, Elastomer Chemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

E. R. Bartholomew

Presided at the morning session of the symposium.

"Combined Effects of Heat and Gamma Radiation on Practical Rubber Compounds" by J. W. Born, E. E. Mooney and S. T. Semegen, B. F. Goodrich Research Center, Brecksville, Ohio. (Paper delivered by Mr. Born).

"Behavior of Some Elastomers in Petroleum Base Fuel at Elevated Temperatures" by R. G. Spain, Wyandotte Chemicals Corp., Wyandotte, Mich.

"The Vulcanization of Butyl Rubber with Phenol Formaldehyde Derivatives," by P. O. Tawney, J. R. Little and P. Viohl, U. S. Rubber Co. Research Center, Wayne, N. J. (Paper delivered by Mr. Viohl).

"High Temperature Resistance of Bonded Polymer to Metal Assemblies (400-500°F.)," by S. L. Brams and F. W. Gage, Dayton Chemical Products Laboratories, Inc., West Alexandria, Ohio.

E. N. Cunningham

Presided at the afternoon session of the symposium.

Part two of the symposium was held in the afternoon of May 15 with E. N. Cunningham presiding. This part of the symposium was to have included five contributed papers. As previously noted, one of the papers was withdrawn and these were the papers heard:

"A New Chlorine-Containing Elastomer" by L. T. Eby and J. V. Fusco, Enjay Co., Inc., Elizabeth, N. J. (Paper delivered by Mr. Eby).

"Inflatable Seals for High Temperature Service" by M. A. Nadler, D. Elkire, W. A. Carr and F. J. French, North American Aviation, Inc., Downey, Calif. (Paper delivered by Mr. Nadler).

"Melting and Glass Transitions in Polyisobutylene," by R. M. Kell, B. Bennett and P. B. Stickney, Battelle Memorial Institute, Columbus, Ohio. (Paper delivered by Mr. Kell).

"Behavior of Silicone Rubber in Sealed Systems at High Temperatures" by W. J. Bobear, Chemical and Metallurgical Division, General Electric Co., Waterford, N. Y.

Abstracts of the papers presented at the symposium as well as abstracts of all the other papers presented at the 73rd meeting may be seen in the April, 1958, issue of this journal.

Fall Meeting Scheduled

The Division of Rubber Chemistry will hold its Fall Meeting in Chicago, Ill., on Wednesday, Thursday and Friday, September 10, 11 and 12. The Hotel Sherman will be the headquarters for the meeting which will be held in conjunction with the meeting of the parent society. The first technical session is scheduled to begin at 2:00 p.m. on Wednesday, September 10, with Dr. Dunbrook presiding. This session will be preceded by a regular meeting of the Twenty-Five Year Club.

A feature of the Chicago meeting will be the presentation of the Charles Goodyear Medal to Dr. Joseph C. Patrick who will deliver his Goodyear Medal address. The Best Paper Award will also be presented to the authors of the most worthy paper at the Cincinnati meeting.

Minnesota Mining Elects Officers

► The board of directors of the Minnesota Mining and Manufacturing Co., Minneapolis, Minn., has elected three of the company's executives as vice-presidents, including Maynard H. Patterson, Robert W. Mueller and Lyle H. Fisher. The board also elected Harold F. Larson assistant treasurer. Mr. Patterson has been general manager of the company's International Division for two years and previous to that, he was general manager of its Canadian subsidiary. Mr. Mueller has been serving as general manager of the Industrial Trades Tape Division since 1955 and had formerly been general sales manager of Minnesota Mining's Coated Abrasives and Related Products Division. Mr. Fisher has been director of personnel relations and industrial relations since 1954, and Mr. Larson has been general office manager for the company since 1954.

Seek Labeling Standard For Tire Advertisers

► The American Automobile Association has called for action from the tire industry and the Federal Trade Commission to clean up the "mumbo jumbo" that exists in the labeling and advertising of passenger car tires. Harry I. Kirk, AAA president, said, "many rubber manufacturers are stretching the patience of motorists to the snapping point. It has become common practice to label third grade tires 'super', 'deluxe', or 'custom'. Often the manufacturers go even further and combine these high-sounding adjectives with other catch words to come up with a tire name like 'new advanced super deluxe', when the particular tire is more cheaply constructed than several others in the same manufacturer's line going under a less pretentious name."

Mr. Kirk explained that there are four broad categories into which most tires are now grouped: premium—the best and most expensive; first line—equal in quality to original equipment on current model cars; second line—sometimes called super line, and third line—usually called economy. However, a manufacturer is free to make any type and quality of tires he chooses and he may call them by any name he chooses. The AAA president emphasized that he is not criticizing the quality of present tires. "The manufacturers have done an excellent job of developing passenger car tires, and many of today's second and third line tires are equal to premium and first line tires of a few years ago, but the motoring public is still entitled to know exactly what it is buying by present standards," he added.

Advertising Guide Considered

Mr. Kirk said the Federal Trade Commission has had under consideration for some time the issuance of a tire advertising guide for tire advertisers and marketers to follow in their labeling. A well-considered guide backed by the authority of the FTC "would have a most salutary effect in eliminating the current mumbo jumbo." Mr. Kirk said the guide, if adopted, would also correct other undesirable practices, such as advertising fictitiously high "list prices" to make the buyer think he is getting a big bargain, and the use of absolute terms like "skid-proof" and "blowout proof." "In actual fact," he said, "no tire we know of today is completely safe from skidding or blowout under any and all driving conditions."

Hydrothane Rubber Coatings

► Phelan-Faust Paint Manufacturing Co., St. Louis, Mo., has developed a new line of urethane production coatings for painting rubber balls and molded rubber toys. Called "Hydrothane," the new line is said to have unusual elasticity and abrasion resistance, excellent chemical resistance and resistance to oils and greases. According to the company, the new material provides gloss, retains this gloss and also remains flexible for the life of the film. Hydrothane is available in different drying times to fit production line requirements.

From left to right: F. W. Wilson, D. E. Fish and S. M. Martin.

Thiokol Chemical Promotes Three

► Dr. S. M. Martin, Jr., vice-president of the Thiokol Chemical Corp., Trenton, N. J., has been appointed general manager of the company's newly formed Chemical Division. D. E. Fish, formerly assistant sales manager of industrial sales, has been named sales manager of the Division, while F. W. Wilson, previously manager of Thiokol's Moss Point plant, has been appointed production manager of the Chemical Division plant at Trenton and Moss Point, Miss. Dr. Martin, who has been with Thiokol since 1932, is a graduate of Clemson College in South Carolina and received his Ph.D. at the University of Pittsburgh.

Mr. Fish, a graduate of Bucknell University, has been with Thiokol in the Sales Division since 1942. Mr. Wilson is a graduate of Princeton University and has been plant manager of the Moss Point Division since 1951. In addition to the Chemical Division, Thiokol now has two other divisions, the Rocket Division and the Specialties Division, which includes Hunter-Bristol and National Electronics Laboratories.

Goodrich Promotes Kenney

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has appointed Robert P. Kenney as director of international activities, in which post he will be responsible for coordinating company activities dealing with foreign associate companies, international sales and foreign licensing. Reporting to Mr. Kenney will be M. W. Larson, director of associate company relations; W. H. Heinlen, acting manager of international sales and P. C. Jones, manager of patents and licenses. A graduate of Dartmouth College, Mr. Kenney joined the company in 1944 as manager of international service after three years in Washington as chief of the vinyl resins unit of the War Production Board. In 1945, he became the first manager of the chemical company's international Sales Department and he was appointed manager of general chemicals sales in 1949. Mr. Kenney has been director of product and process licensing for the company since last July, when he returned from a two year assignment as European director of chemical activities for the B. F. Goodrich Co., representing both the chemical company and the Research Center. He is a member of the American Chemical Society, the Chemist's Club of New York and the Commercial Chemical Development Association.

Builds Small Inflatoplane

► A 205 pound junior size collapsible aircraft has been added to the Inflatoplane series by the Goodyear Aircraft Corp., Akron, Ohio. The plane, to have made its first public showing during Armed Forces Day observances May 10 and 11 at Andrews Air Force Base, Washington, D. C., is an improved version of the GA-447 which was recently built and flight tested by Goodyear Aircraft for the Office of Naval Research (ONR). The Army and Navy have each procured five models for field evaluation. The new, all-rubber aircraft, constructed of a structural material called "Airmat," can be collapsed into a small package; can be assembled and made ready for flight in five minutes; has a take-off distance of approximately 300 feet, and all-surface operating capabilities, according to Goodyear. Seven pounds of air pressure per square inch is required to inflate the plane and air pressure is maintained by a continuously-driven, engine-mounted compressor, even when the fuselage is riddled by bullets. The Inflatoplane's 205 pound airframe has a payload capacity of 250 pounds plus fuel for seven hours of flight. Stall speeds of 41 miles-per-hour, cruise speeds of 60 mph and a maximum speed of 72 mph can be obtained with the craft's 42-horsepower Nelson engine at altitudes up to 8000 feet.

DuPont Names McCoy General Manager of Elastomer Chemicals Department

► E. I. du Pont de Nemours & Co., Inc., Wilmington, Del, has announced that Charles B. McCoy, formerly assistant general manager of the Electrochemicals Department, has been named general manager of the Elastomer Chemicals Department, succeeding George E. Holbrook, who has been elected a vice-president, director and a member of the Executive Committee. Walter J. Beadle, whom Mr. Holbrook succeeds, has retired as a vice-president and member of the Executive Committee, but will continue as a director. The company has also announced that membership of the board of directors has been increased to 32, and the re-election of Walter S. Carpenter, Jr., as chairman of the board; Crawford H. Greenewalt, as president of the company, and all other principal officers.

Mr. McCoy started with DuPont in 1932 as an operator at the Spruance cellophane plant in Richmond, Va., and soon afterwards, was transferred to the Carney's Point, N. J., Works as a chemist. In 1933, he joined the Engineering Department as an industrial engineer at the Chambers Works, Deepwater Point, N. J., later becoming assistant division purchasing agent. In 1935, he was assigned to the company's London office and was advanced to assistant manager there early in 1939. He returned to this country later that year as a special assistant in the Smokeless Powder Division of the Explosives Department. Mr. McCoy was appointed director of the Chemical and Miscellaneous Sales Division in 1940 and in 1943, he became director of sales of the Explosives Division. In December, 1950, he was appointed assistant general manager of the Electrochemicals Department.

Charles B. McCoy

Mr. Holbrook joined Du Pont in 1933 at the Jackson Laboratory, Deepwater Point, N. J., and ten years later, became assistant director there. Since then, he has held many posts including general superintendent of development at the Chambers Works; assistant director, director and departmental engineer of the Organic Chemicals Department's Technical Division; manager of the plant development section; assistant director in the Development Department; chairman of the Committee on Fellowships and Grants; general manager of the Organic Chemicals Department and finally general manager of the Elastomer Chemicals Department. Mr. Holbrook is also a director of Du Pont Co. (United Kingdom) Ltd.

Opens European Office

► Rubber Chemicals Division of Phillips Chemical Co., has opened a new office at Limmatquai 70, Zurich, Switzerland, to serve European customers in the synthetic rubber and carbon black fields. Jan Willums, who has been in Zurich as European manager of the Rubber Chemicals Division since 1954, has taken charge of the new office. He joined Phillips in 1948 as technical representative in Copenhagen, Denmark. Mr. Willums studied chemical engineering in Norway and received a degree in industrial engineering from the University of Akron, Ohio. He is a member of the American Chemical Society and various rubber associations in Europe. Agmund Thorsrud, European technical representative, joined Phillips in 1957 as an assistant to Mr. Willums. He is a graduate of the State University of Technology at Trondheim, Norway, and spent two years at the French Rubber Institute in Paris. Mr. Thorsrud is former director of research and development at the Central Laboratories of A/S Askim Gummivarefabrik of Norway.

Buys Polymer Industries

►Philip Morris, Inc., New York, N. Y., has acquired Polymer Industries, Inc., Springdale, Conn., according to a joint announcement from the companies. The acquisition is the second step in a Philip Morris diversification program which was begun last year when the company acquired Milprint, Inc., producer of flexible packaging. Terms of the transaction were not disclosed. Speaking of the merger, Dr. Frank D. Campins, president of Polymer said "We are a small and relatively new company at the present time, and we have done well. But now that we are part of the Philip Morris family, we can look forward with keen anticipation to a very bright future. This association will be of much benefit to us in streamlining our organization and in helping to develop the great potential I know we have." A spokesman for Philip Morris stated the belief that by combining the great stability of earnings of the cigarette industry with soundly managed companies having above average growth prospects, the company will be in a position to increase its future potential.

Research Synthetic Developed

► A new synthetic rubber, called "Deuterio Rubber," developed by the B. F. Goodrich Co., Akron, Ohio, is expected to help scientists discover more about the properties of natural rubber. The new material was synthesized at the B. F. Goodrich Research Center by a team headed by Dr. David Craig, research associate, under the sponsorship of Goodrich-Gulf Chemicals, Inc., Cleveland, Ohio. Scientific studies are expected to lead to improvements in the quality of rubber products and to a more complete understanding of rubber and the rubber state in the fields of heat, radiation and oxidation-resistance, and gas permeability.

Due to its high cost, use of Deuterio rubber will be restricted to research. More rubbery than other rubbers, its unique molecular composition consists of heavy hydrogen (deuterium) atoms, obtained from heavy water, which replace the conventional hydrogen atoms attached to the carbon chains in the molecules of ordinary rubbers. Molecules containing deuterium atoms attract each other less strongly than do those containing hydrogen atoms, this exchange resulting in a more fluid, elastic rubber. The new material can be vulcanized exactly like crude rubber, gives good tensile qualities in pure gum stocks and does not require carbon black reinforcement to develop high tensile properties.

It is not believed that the new material has commercial possibilities, at present, although preliminary work indicates that it has many interesting properties, some of which may be superior to those of crude rubber, Goodrich states. Eventually, a rubber of this type might be made and used for some very special purposes.

Goodyear Pliolite S-6E

► Chemical Division of the Goodyear Tire and Rubber Co., Akron, Ohio, has developed a new electrical grade rubber reinforcing resin, called "Pliolite S-6E," designed to meet requirements of the electric wire and cable industry. Excellent electrical properties of the new resin are made possible through improved polymerization techniques which improve ash content and water absorption, the company states. Pliolite S-6E in rubber stocks is said to increase hardness, stiffness, flex life and abrasion resistance, to furnish excellent tear resistance and to improve aging characteristics. In addition, Pliolite S-6E effectively reduces the "nerve" of rubber stock. A high styrene-butadiene resin, Pliolite S-6E exhibits exceptional processability and makes possible production economies since it disperses readily on a mill or in a banbury mixer, according to Goodyear. The new resin has a softening point well within the range of normal processing temperatures. Laboratory evaluation of test formulations utilizing Pliolite S-6E showed a volume resistivity of 5.62 ohms/cm 10-14 at 77°F. Produced as dustless white granules and packaged in 40-pound multi-wall bags, Pliolite S-6E is available on a commercial scale.

Philadelphia Hears Sigmann Talk On Designed Experiments

► Approximately 160 members and guests attended the April 25 dinner-meeting of the Philadelphia Rubber Group held at the Poor Richard Club, Philadelphia, Penna. Chairman R. A. Garrett announced that progress is being made on a 1958 directory for the Philadelphia group with committee chairmen George McNamara and H. M. Sellers working out the details.

The featured speaker of the evening was John Sigmann of R. T. Vandervilt Co. whose topic was entitled "Designed Experiments." Mr. Sigmann stated that planned experiments in rubber compounding make the art of compounding more statistical. He emphasized that this is dependent on experience and he showed the difference in approach using three variables — time, acceleration, and filler — between the classical experiment and the statistical one.

The statistical approach depends on the type of question involved and the number of variables. It uses one half replicas, one fourth replicas or latin squares. This will show by logical calculated risk steps wherein the direction of the final solution lies by victor analysis. Mr. Sigmann said that statistics shorten the length of blind alleys. He concluded that 90 per cent of the success of the significance of an experiment lies in the preliminary thinking.

Produces Foreign Auto Tires

► Firestone Tire & Rubber Co., Akron, Ohio, is now producing tires that can be used on 95 per cent of the foreign autos being operated in this country. The company said these tires are being made in the eight most popular sizes and are now available at Firestone stores and dealers throughout the nation. Firestone said more than 50,000 of these foreign car tires have already been produced at its plants in Los Angeles, Calif., and Akron in both white and black sidewall styles. Officials of the company said the tremendous increase in the number of foreign cars in this country in recent years has created a strong demand for American-made tires in sizes to fit foreign cars. The foreign car tires manufactured by Firestone in the United States are of the tubeless variety and of the same basic design which are original equipment on automobiles manufactured in this country. The number of cars annually imported into the United States has increased from a rate of about 32,000 in 1954 to an estimated 300,000 a year at the present time.

Metal Hydrides Names Agent

► Metal Hydrides Inc., Beverly, Mass., has appointed P. L. Blanchard & Co. of Newton, Mass., as New England sales agents for hydride products in the rubber, paint and plastic industries. The primary products to be handled by Blanchard will be borohydride compositions to produce foam or sponge products.

Frank W. Burger

J. A. MacKay

Phillips Chemical Personnel Changes

► The Rubber Chemicals Division of the Phillips Chemical Co., Akron, Ohio, has announced the promotion of J. A. MacKay to the newly created position of assistant manager of domestic sales at the company's Akron office. Frank W. Burger, formerly technical sales representative in Providence, R. I., succeeds Mr. MacKay as sales manager of the central district, also located at Akron. Other changes announced by the company include the appointment of Warren S. Hall as manager of sales development, with headquarters in Akron, and James A. Millar as technical sales representative. Clifford Abbott has been named manager of the Akron laboratory and Howard J. Hugus has been added to the laboratory staff. The company has also transferred C. H. Edwards, Jr., from Akron to Dallas, Texas, as a technical sales representative and has named George D. Covington to succeed Mr. Burger as technical sales representative in Providence. Daniel Farynyk has joined the Chicago office staff as technical sales representative.

Goodyear Appoints Three

► Three key appointments in the production organization have been announced by the Goodyear Tire & Rubber Co., Akron, Ohio. John Q. Shaul, former superintendent of Goodyear's Akron Plant Two, has been named director of production for Goodyear-Great Britain. He replaces Howard L. Ginaven, formerly of Akron, who has returned to Akron as superintendent of Plant Two. In another change, Richard E. Ward has been appointed manager of plant engineering and maintenance at the Goodyear plant in Wolverhampton, England. Mr. Ward had been division foreman of Goodyear's Akron Plant One maintenance and machine installation.

In his new post, Mr. Shaul will be responsible for production at Goodyear's plants in Wolverhampton, Wallasey and Glasgow, Scotland, with headquarters in Wolverhampton. He has been with the company since 1936, graduating from the training squad in 1942. Mr. Ginaven joined the firm in 1934 and held a number of positions in technical service and tube development before the company's foreign operations. A civil engineer, Mr. Ward joined Goodyear in 1948 and held a number of supervisory engineering positions before becoming a division foreman.

Goodrich Fuel Oil Hose

► A new fuel oil hose said to be faster-flowing and to speed truck-to-home delivery by 17 per cent has been introduced by the B. F. Goodrich Industrial Products Co., Akron, Ohio. The hose has the same outside diameter as a conventional 1¼ inches fuel oil hose, permitting the same amount of hose per reel. Flow may be increased up to 20 per cent, without sacrifice to strength, by enlarging inside diameter of the hose from 1¼ inches to 1⅜ inches. A new combination of reinforcing fabrics permits the new thin wall design to withstand the same working pressures as regular fuel hose and a black cover resists oil, weathering and abrasion, Goodrich claims.

Appointed Cabot Agent

► Ivan T. Bauman Co. of St. Louis, St. Louis, Mo., has been appointed agent for the sale of carbon black in the metropolitan St. Louis, eastern Missouri and southern Illinois areas by Godfrey L. Cabot, Inc., Boston, Mass. Ivan T. Bauman, president of the firm, has had considerable experience in the selling and warehousing of raw materials. The Bauman company maintains its own warehouse, thus ensuring a ready supply of its principal's products to their customers.

L. H. Howland

B. L. Johnson

D. F. Behney

Three New Rubber Division Appointments

► The Division of Rubber Chemistry of the American Chemical Society has announced that L. H. Howland has been appointed assistant secretary and D. F. Behney, assitant treasurer of the division, while B. L. Johnson has been named associate editor of the organization's publication, *Rubber Chemistry and Technology*. Dr. Howland, manager of colloidal products research and development for the Naugatuck Chemical Division of the U. S. Rubber Co., has made several contributions to the development of cold synthetic rubber, continuous polymerization of synthetic rubber and synthetic rubber latices.

Dr. Howland attended the University of Louisville in Kentucky, where he received his Bachelor's and Master's degrees and was awarded his Doctorate at the University of Iowa. In 1928, he joined the U. S. Rubber Co. as a research chemist at the company's general laboratories in Passaic, N. J., and was appointed manager of the Organic Research Group a few years later. In 1938, he was transferred to the Naugatuck Chemical Division, where he became manager of rubber chemical and synthetic rubber development, and technical service. He was appointed manager of the organic and colloid research group in 1943, manager of synthetic rubber development in 1946 and was assigned to his present post in 1955. Dr. Howland is active in technical groups and is a member of several of the divisions of the American Chemical Society as well as of the parent organization. In addition, he has written many articles and technical papers on synthetic rubber and is the holder of approximately 50 patents in the field of rubber chemistry.

Mr. Behney, vice-president of sales for the Harwick Standard Chemical Co., Akron, Ohio, has been associated with the rubber industry for more than 20 years. A graduate of North Carolina State College of Agriculture and Engineering with a B. S. in chemical engineering, he began his career in 1935 with the Goodyear Tire and Rubber Co., in squadron-production. He served that firm in several capacities including development compounding, service compounding-Airfoam, and purchasing. In 1950, Mr. Behney joined Harwick as assistant to the president. He was named general sales manager in 1951 and was appointed to his present position as vice-president of sales in 1956. A member of the A. C. S. of long standing, Mr. Behney has served with several of the organization's divisions in executive capacities. He is also associated with several rubber groups; is a member of the Society of Plastics Engineers; the Akron Council of Engineering and Scientific Societies; the Rubber Chemical Salesman's Association of Akron, Inc., as well as a fellow of the American Institute of Chemists.

Dr. Johnson is a group leader of the Special Rubbers Division for the Chemical and Physical Research Laboratories of the Firestone Tire and Rubber Co., Akron, Ohio. Born in Elkhart, Ind., he received his B. S. degree from Purdue University in 1928 and then joined Firestone as a member of its student training class. In 1930, he began graduate work, obtaining an M. S. from the University of Illinois in 1931, and a Ph.D. from the University of North Carolina in 1933. He returned to Firestone as assistant to the chief chemist at the Xylos Rubber Co., Reclaiming Division. In 1937, Dr. Johnson became a member of the research staff and has recently been active in research on coral rubber. He is a member of the American Chemical Society and its Rubber Chemistry and Polymers Divisions and is a past secretary and a member of the council of the Akron section. He is also a member of Alpha Chi Sigma and Sigma Xi.

Carwin Names Representative

► Charles F. Blaich, Jr., has joined the Sales Department of the Carwin Co., North Haven, Conn., as technical representative. He will be responsible for the sale and market development of Carwin's growing line of special isocyanates and other chemicals for use in polymer manufacture. Mr. Blaich was graduated from Lebanon Valley College and has a background of sales and sales development experience with the DuPont Finishes Department and the Armour Chemical Division.

Columbia-Southern Names Sadler

► Columbia-Southern Chemical Corp. of Pittsburgh, Penna., has announced that George W. Sadler has been named technical representative of the Boston district sales office. A graduate of Franklin Technical Institute, Mr. Sadler was assigned to the Boston office following completion of an orientation program at the firm's Barberton, Ohio, chemical producing plant. Mr. Sadler formerly had been associated with Avon Sole Co. and more recently with Tyer Rubber Co. in Andover, Mass.

Named to Executive Post

► Wilber C. Nordstrom has been elected vice-president of manufacturing for the Standard Products Co., Cleveland, Ohio. Mr. Nordstrom, who joined Standard Products in 1950, has served successively as manager of the West Coast Division, manager of the Reid Division at Cleveland, manager of manufacturing and general manager of manufacturing. Previously, he was associated for ten years with Thompson Products in the Aircraft Accessories Division. Mr. Nordstrom is a graduate of the University of Michigan.

Akron Meeting Features Natural Rubber Review

► The April 11 meeting of the Akron Rubber Group was held at the Sheraton-Mayflower Hotel in Akron, Ohio and featured a symposium on "A Complete Review of Natural Rubber." In addition to the panel held during the afternoon, the program included a dinner followed by a talk by Sherlock Holmes Evans who spoke on "Pink Pills for Pale People."

The symposium got underway with a talk by Sidney J. Pike of the S. J. Pike Co., who presented a travelogue on the rubber producing areas covering plantations as well as types and classifications of natural rubber. His talk brought out the many differences between the production of what is known as European Owned Estates and that of Native Estates. The production of rubber being divided, roughly speaking, into half European owned and half Native.

Slides were used to show the production of liquid latex on both European and Native Estates and how the liquid latex was then made into pale crepes and no. 1 sheets as produced on the European Estates. Mr. Pike brought out the significance of both European and Native rubber production and stressed particularly throughout his talk that there is a useful place for all of the types of rubber produced, irrespective of its origin or quality of the rubber produced.

R. B. Knill (Goodyear), a member of the Program Committee, stands behind panel members at the Akron Rubber Group Meeting.

Natural Rubber Developments

The second speaker on the panel was Dr. D. J. Angier of the General Tire & Rubber Co. who presented a slide-lecture on the fundamental chemistry and composition of crude rubber and also discussed some recent developments in that field, such as graft polymers. Dr. Angier stated that natural rubber is undoubtedly one of nature's great gifts to man, and that without it, the present mode of living would not be possible.

It is true to say that synthetics can replace natural rubber in many applications often with advantage. However, without the knowledge and experience gained from natural rubber it is doubtful whether the great technological advances of the last two decades in synthetics would have yet materialized, he stated.

As always, when a product becomes indispensable to modern living, this constitutes a challenge to find something as good, better or cheaper. At the present time it would seem that natural and synthetic elastomers can live in harmony, at least until the economics of man-made cis-polyisoprene becomes known. Even so, it is difficult to imagine factories so productive that the ever increasing demands for elastomers can be entirely met by man-made polymers. Another important consideration is the increasing demand for monomers to be met from ultimately exhaustible oil reserves, Dr. Angier declared.

The third and final part of the symposium was presented by W. J. Sears, vice-president of the Rubber Manufacturers Association, who discussed the past, present and future of crude supplies. Mr. Sears had prepared a statistical analysis and forecast for the world consumption of rubber through 1966 (see accompanying table). He stated that the demand for all kinds of rubber will continue to increase in the years ahead. Part of this increased rubber requirement must be satisfied with natural rubber or a natural rubber substitute in order to produce certain rubber products of satisfactory quality.

Calls For Replanting

In order to assure a readily available stock of natural rubber, Mr. Sears recommended that production be increased by replanting old trees and developing areas for planting of new trees. He also suggested that by lowering production costs through planting only highest-yielding clones, the optimum amount of rubber would be guaranteed for world wide utilization.

Conversely, the natural rubber industry could lose its position and price itself out of the market if it doesn't increase production and if it doesn't lower the cost of production. The basic characteristics of natural rubber which are so important to the rubber manufacturing industry today could be supplied in the future by the new isoprene types of synthetic rubber.

If natural rubber supplies are not increased, the price of the inadequate supplies would be bid up to a level that would stimulate and make commercially feasible the production of the new synthetic substitutes. Mr. Sears concluded that future developments must be carefully and continually observed since Southeast Asia is perhaps the most unstable area in an unstable world, and there is an old Yankee tradition concerning the necessity of keeping one's powder dry.

World Rubber — Supply and Demand — 1950 to 1980

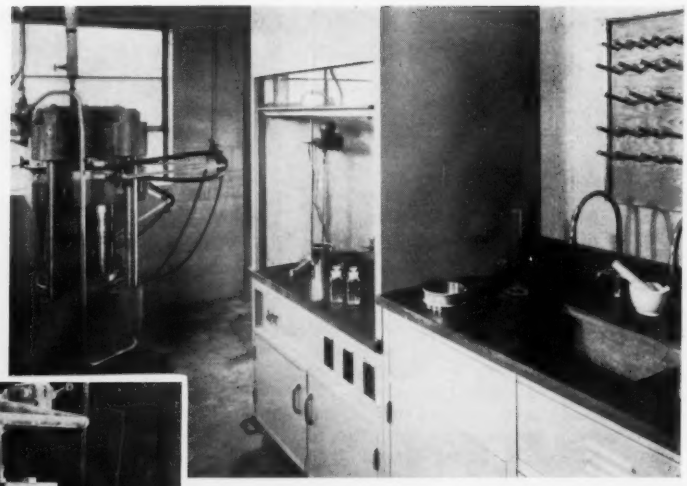
(1,000 long tons)

	1950	1960	1970	1980
Natural Rubber Production	1,860	1,915	2,500	2,850
Natural Rubber to Communists	188	271	436	702
Balance for Free World	1,672	1,644	2,064	2,148
Adjusted Free World Consumer Natural Rubber and Synthetic Rubber	2,115	3,781	4,564	5,548
Synthetic Rubber Required for Free World	443	2,137	2,500	3,400
Ratio Synthetic Rubber to Total	20.9%	56.5%	54.8%	61.3%

Producing Stronger Rayon Cord

► Industrial Rayon Corp., Cleveland, Ohio, has started limited production of what is said to be a stronger rayon tire cord with substantially improved performance characteristics, and plans to increase production of the new tire rayon during the third quarter of this year. At the annual shareholders meeting, a company spokesman reported that the new yarn represents an important achievement in a program to produce even stronger tire cord and is about 50 per cent stronger than tire cord produced only six years ago. This development is expected to further increase the performance of the rayon cord tire as well as its economic value. It was noted that the current low level of business in the rayon industry appears to have reached "a bottom" with substantial improvement unlikely until later in the year. The company's operating rate for several of its products has been severely curtailed to current low levels to reduce inventories or to avoid building inventories to excessive levels in the light of curtailed sales. At the meeting, all directors of the company were re-elected.

A-S-H Molded Products Opens New Facility For Production of Precision Molded Goods



◄ A yellow brick plant and warehouse on three acres of a 25 acre plot in Frazer, Penna., the unit's main building houses manufacturing floor space; metal pickling facilities; shower and locker rooms; a laboratory, and office space. Production of precision molded parts begins with the preparation of rubber or synthetic for the presses. Rubber formulas are compounded on a batch basis, with all materials weighed and mixed as needed.

▲ The new plant, equipped to tackle molding problems where the end use demands critical chemical or physical control of manufacturing specifications, includes a modern Physical and Chemical Laboratory which exerts complete control over every step of its manufacturing process and carries on an active program of research and development. Services of the laboratory group are made available for the solution of manufacturers problems.

Thiokol Approves Merger

► Stockholders of Thiokol Chemical Corp., Trenton, N. J., have approved a plan to merge with Reaction Motors, Inc., through the exchange of 1¼ shares of Reaction Motors common stock for 1 share of Thiokol common. Stockholders of Reaction Motors, Inc., met at Rockaway, N. J., after the Thiokol meeting and also approved the merger. A two-thirds vote was necessary in each case. The merger was to have become effective by the end of April.

J. W. Crosby, Thiokol president, repeated his earlier forecast that the company's sales and earnings for 1958 were expected to be about 50 per cent higher than in 1957. Thiokol is now considering additional financing, but has not decided on what form it will take. It was indicated that the decisions would be made before the end of 1958. In addition, the company is preparing to ask for a listing of its stock on the New York Stock Exchange. Thiokol shares currently are traded on the American Exchange.

An official of Reaction motors stated at the meeting that the company's earnings for 1958 are expected to be about the same as for 1957, but that in 1959, the company anticipates an increase in fixed-price business. Among the projects on which Reaction Motors is now working are the engines for the X-15 rocket plane, the Corvus air-to-ground missile and a catapult for the navy to use on carriers.

In other occurrences at the meeting, T. E. Walkowicz, technical adviser to Laurance S. Rockefeller, who owns a substantial interest in Reaction Motors, was elected a director. Other Thiokol executive appointments include the election of H. R. Ferguson, formerly vice-president and treasurer, as executive vice-president, and the election of Dr. H. W. Ritchy, previously technical director of Thiokol's Rocket Division, as a vice-president.

Piers Named Department Head

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has appointed Joseph P. Piers to head the Production Department at the company's new general chemicals plant in Henry, Ill. Previously, Mr. Piers served as general foreman in the rubber chemicals section of the company's Akron Chemical plant. A graduate of Purdue University, where he received a B. S. degree in chemical engineering, Mr. Piers joined Goodrich Chemical in 1949 as shift foreman at the Louisville, Ky., plant. In 1952, he became assistant general foreman at Goodrich Chemical's Calvert City, Ky., plant working on construction and production of the acrylonitrile and vinyl chloride units. Mr. Piers was assigned to the Akron plant in 1956.

Goodrich Expansion Program

► B. F. Goodrich Co., Akron, Ohio, has announced plans to spend $35,000,000 for capital expenditures and investments in 1958 "as an expression of confidence in the future", almost as much as the 1957 expansion expenditure of $38,871,000. Expansions and new plants nearing completion or already starting operations include the addition to the Miami, Okla., plant, now nearing capacity operation in the manufacture of giant off-the-highway tires; completion of the textile plant for tire cord at Exeter Borough, Penn.; construction of a general chemicals plant at Henry, Ill., where operations are expected to begin in June 1958; construction of a new adhesive plant at Akron, Ohio, which will commence operations early this fall; construction and near completion of a manufacturing and warehouse space and equipment addition at the Marietta, Ohio, plastics plant; a similar addition at the sponge and latex foam plants at Shelton, Conn., which is under way, and the completion and early operation of the plant at Calvert City, Ky., for the manufacture of acrylic polymers. Company executives expressed confidence that growth will be resumed in the United States with the upturn of the present economic adjustment. They said Goodrich is laying plans and organizing for an important share in the long-term growth of the world economy.

Buffalo-Ontario Joint Meeting Hears Garvey On Rubber Changes

► The 17th Annual International Meeting of the Buffalo and Ontario Rubber Groups held on May 9 at Hotel Sheraton Brock, Niagara Falls, Ont., Canada, was attended by 350 members and guests and featured an address by Dr. B. S. Garvey, Jr. Dr. Garvey, director of Sales Service Laboratories for the Pennsalt Manufacturing Co. and past-chairman of the Division of Rubber Chemistry, A.C.S., chose "The Changing Picture in Rubber Chemistry" as the subject for his talk. In his discussion, Dr. Garvey compared the present situation with one in the past, because such a comparison seemed both interesting and instructive.

In 1927 there was essentially only one rubber in use, Hevea. The other compounding materials given in a price list for March, 1927 took up about one page and covered approximately 250 items in all types. With regard to rubbers in use, the situation in the late twenties was probably the simplest it ever has been or ever will be. By that time the plantations of the Far East were in full swing. A few grades of smoked sheets and crepe had almost eliminated the great variety of wild rubbers which had been used ten and fifteen years earlier. The use of latex had hardly begun, Dr. Garvey observed.

Over the next few years the concepts of giant fiber molecules, the kinetic basis of elasticity, the scission of molecules by mastication and oxidation, and the cross linking during vulcanization developed into a coherent and comprehensive theory. Similar theories were developing concurrently in the fields of plastics, fibers, and polymers. All of these are now blended into our current theory of high polymers. Rubber chemists have been major contributors to the development of this theory.

100th Anniversary Marked

Dr. Garvey said, in 1939 the Division of Rubber Chemistry celebrated the 100th anniversary of the discovery of vulcanization. During that century, he said, we had learned a great deal about the compounding, processing, and use of natural rubber. Much of this knowledge has been coordinated theoretically, especially in the last fifteen years.

From 1939 through 1941 there was increasing anticipation and finally full realization of the fact that we had only a short time in which not only to develop a substitute for natural rubber but also to get it into full scale use all over the country. The production of butadiene-styrene rubber on a large scale has been amply discussed and widely acclaimed as a major achievement. While less spectacular and less appreciated, the wide scale compounding and use of GR-S was an achievement of equal importance.

Dr. Garvey noted that we have seen that the complications of rubber chemistry and of rubber compounding have been tremendously increased by the phenomenal advances of the past thirty years. The complications will probably increase even faster in the future than in the past, as the pace of research and development continues. The rapid growth in complications has resulted from the development of comprehensive theories which have guided the growth of material progress. In turn the control of these complications has been and will continue to be possible by the use of these same theories to systematize and coordinate the vast amount of information used in rubber compounding today, Dr. Garvey concluded.

NBS Standard Compounding Samples

► National Bureau of Standards, Washington 25, D. C., has made two additions to its list of materials for rubber compounding, "Standard Sample No. 383", mercaptobenzothiazole, and "No. 385", natural rubber. Seventeen references standards, including vulcanizing agents, accelerators, fillers, and other compounding ingredients, are now available for use in the quality control of rubber raw materials and rubber production. The new standards represent the culmination of work started at the Bureau in 1927. At that time a program was sponsored by the Division of Rubber Chemistry of the American Chemical Society, and the Rubber Manufacturers Association to develop methods for evaluating plantation rubber. The standard formulae and procedures used today for preparing test vulcanizates of natural rubber resulted from that early effort. These two new materials also complete the standard samples required for preparing the standard natural rubber compounds of the American Society for Testing Materials under Designation D15-57T. The 17 standard samples with their prices and weights are listed in the accompanying table.

Number	Name	Approx. weight of sample in grams	Price per sample
370	Zinc oxide	2000	$ 2.15
371	Sulfur	1400	1.75
372	Stearic acid	800	1.90
373	Benzothiazyl disulfide	500	1.75
374	Tetramethylthiuram disulfide	500	3.50
375	Channel black	7500	3.50
376	Light magnesia	450	2.40
377	Phenyl beta-naphthylamine	600	4.00
378	Oil furnace black	7000	3.50
379	Conducting black	5500	3.50
380	Calcium carbonate	6000	2.50
381	Calcium silicate	4000	2.50
382	Gas furnace black	7500	3.50
383	Mercaptobenzothiazole	800	2.75
385	Natural rubber	31500	44.00
386	Styrene rubber, type 1500	34000	38.00
387	Styrene rubber, type 1000	34000	*

*To be revised.

Amoco Appoints Parkinson

► Amoco Chemicals Corp., Chicago, Ill., has announced the appointment of Laurel G. Parkinson as general sales manager of chemicals. Mr. Parkinson was previously associated with Lever Brothers Co., New York, N. Y., as manager of the Industrial Chemicals Department and prior to that was with the Atlas Powder Co. He was graduated from Kent State University in 1927 with a B.S. degree in chemistry and has done graduate work at Ohio State and Temple Universities. Mr. Parkinson is a member of the American Chemical Society, the American Association for the Advancement of Science, the Chemists' Club in New York, the Commercial Chemical Development Association and the Salesmen's Association of the American Chemical Industry.

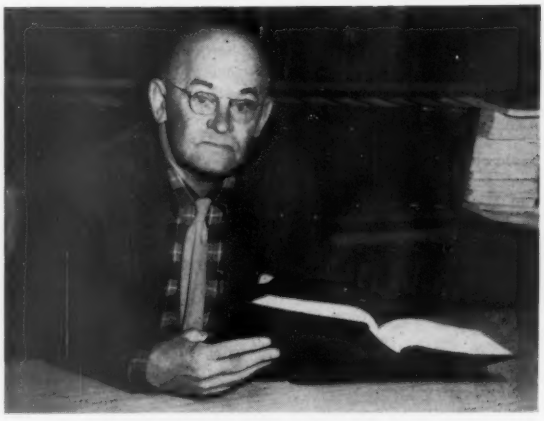
Union Carbide XK-1039

► Silicones Division of Union Carbide Corp., New York, N. Y., has developed a new, extremely hard, general purpose compound designated "Union Carbide XK-1039 Silicone Rubber Compound." The company states that this 85 ± 5 Durometer hardness material has low compression set, low moisture absorption, high temperature stability, good release properties and does not require the use of toxic additives. It can be molded, calendered or extruded and is said to be particularly suited for fabrication of rubber rolls used in the textile, plastics, paper and printing industries. A four page data sheet (SF-1124) may be obtained from the company.

Gallowhur Markets Puratized

► Gallowhur Chemical Corp. of Ossining, N. Y., manufacturers of bactericidal and fungicidal chemicals, is now marketing "Puratized" concentrate for the manufacture of plastic and rubber products. The product, soluble in most plasticizers and rubber article preparations, provides superior germicidal properties to the finished product. It is self-deodorizing, mold-resistant and germ repellant. Developed for the U. S. Army during World War II, Gallowhur officials reported that Puratized has been incorporated into many articles, from toothbrushes to shoe linings, with outstanding consumer acceptance.

Dr. Patrick To Receive Goodyear Medal



► The Division of Rubber Chemistry of the American Chemical Society has announced that Dr. Joseph C. Patrick, consultant for the Thiokol Corp., has been selected to receive the 1958 Charles Goodyear Medal, which will be awarded during the 134th National Meeting of the A. C. S., to be held in Chicago on September 10-12. Dr. Patrick, discoverer and pioneer in the production of "Thiokol" oil-resistant synthetic rubber, was proposed by E. M. Fettes to receive the medal, which is awarded annually by the Division of Rubber Chemistry "to stimulate interest in fundamental research in rubber and to honor those who have performed outstanding service to rubber science."

Dr. Patrick, holder of 50 patents, developed the chemical methods of synthesis, control of quality, vulcanization and processing of "Thiokol" rubber, said to be the most oil and solvent-resistant of all synthetic rubbers. He is cited for discoveries which led to the production of the polysulfide rubbers, the first synthetic rubbers to be produced in the United States. These elastomers are important because of their ability to handle difficult applications for rubbers in American aircraft, automotive and petroleum industries. Dr. Patrick's main contribution was not in the discovery of the fact that ethylene dichloride reacted with sodium tetrasulfide, but rather in his investigation of the consequences of the reactions and his conviction that this class of products was useful and valuable.

Dr. Patrick not only developed polymerization in suspension, copolymerization and methods for cross-linking polysulphide polymers, but also developed a technique for making low-molecular weight liquid rubbers capable of being cured to elastomeric composition. This was the first liquid elastomer and it has broadened greatly the possible methods of using synthetic rubber in impregnation, casting, and coating of other structural materials. The liquid polymers have also been of great value in making the solid propellants necessary for the modern rockets and missiles of the Armed Forces.

The fundamental discovery, made at Jet Propulsion Laboratory of the California Institute of Technology, that Thiokol synthetic rubber could be used as a rocket fuel, brought about the revolutionary development of the product for guided missiles and rocket motors including three stages of the Jupiter, the Army's satellite carrier.

Born in Jefferson, City, Mo., Dr. Patrick attended the Kansas City College of Medicine and Surgery. His education was interrupted by World War I and his service in France with the Army Medical Corps. After discharge from the Army, he worked as a chemist with Armour & Co. in the Argentine before completing his work for the medical degree. He never practiced medicine, but opened his own chemical research laboratory, the Industrial Testing Laboratory, in Kansas City, Mo., where he discovered synthetic rubber in 1928 during research work on anti-freeze.

A founder of the Thiokol Chemical Corp., when the company was formed the following year, he became a vice-president and director of research and was in charge of the research and development work on this synthetic for twenty years. Dr. Patrick is a member of the AAAS, Faraday Society and Franklin Institute as well as of the American Chemical Society.

Goodyear Introduces New Truck Tire

► Goodyear Tire & Rubber Co., Akron, Ohio, has introduced a new truck tire specially designed for rock excavating, mine and quarry work. Named the "Hard Rock Lug Xtra Tred," the tire is made with 3-T nylon cord and is "beefed up" with as much as 30 per cent more rubber by weight in the tread. This extra heft of tread rubber is said to enable the tire to wear longer despite cutting and bruising hazards prevalent in rock excavating, mining and quarrying operations. Wide lugs and thick shoulders tapered down the side of the tire provide pull, grab and traction, while triple-tempered nylon cord increases the tire's resistance to bruising and carcass breaks and adds to its retreadability, Goodyear states. The Hard Rock Lug Xtra Tred is available in sizes ranging from 14.00-24 to 18.00-33, tube-type and from 14.00-25 to 18.00-25, in tubeless style.

Four New Philprene Compounds

► Phillips Chemical Co., Akron, Ohio, has introduced four new compounds including "Philprene 1010," "Philprene 1100," "Philprene 1104" and "Philprene 1600." Philprene 1010 is a low Mooney rubber, designed primarily for chemically blown sponge. It is a butadiene - styrene copolymer, emulsion polymerized at 117° F., using fatty acid soap. Coagulated by alum, the compound contains a non-staining antioxidant. Philprene 1100, a mixture of 100 parts of butadiene-styrene copolymer, is emulsion polymerized at approximately 122° F., using a fatty acid soap and 50 parts of Easy Processing Channel black. Used in black tire sidewalls, molded products and miscellaneous mechanical goods, this compound is coagulated by salt-acid and contains staining antioxidant.

A mixture of 100 parts butadiene-styrene copolymer, emulsion polymerized at approximately 122° F. with a fatty acid soap and 50 parts of Philblack A, Philprene 1104 is coagulated by salt-acid and contains a non-staining antioxidant. This product is applicable for calendered, extruded and molded goods where smooth out and flow characteristics are desired. Philprene 1600 consists of 100 parts of butadiene - styrene copolymer, emulsion polymerized at approximately 41° F., using a rosin acid soap and 50 parts of Philblack O. Coagulated by salt-acid, it contains a staining antioxidant. The material is suitable for use in tires, camelback, and mechanical applications and is said to provide the greater reinforcement of HAF black for better physical properties.

Named Marketing Director

► Arthur P. Kroeger, formerly associate director of marketing for the Organic Chemicals Division of the Monsanto Chemical Co., St. Louis, Mo., has been appointed director of marketing for the division, succeeding John L. Hammer, Jr. Mr. Kroeger, a graduate of the University of Akron, joined Monsanto at Akron in 1929 as a sales representative for the company's rubber chemicals. He has served in various sales capacities in Japan and the United States and in 1945, he was appointed assistant general manager of sales for the Organic Chemicals Division. Mr. Kroeger became the division's director of sales in 1953 and was appointed associate director of marketing in 1955.

Stauffer Appointments Announced

► Philip H. McLaughlin has been appointed manager of sales development for the Industrial Chemicals Division of the Stauffer Chemical Co., New York, N. Y., while Ernest W. Rivers has been named to head the Product Manager Group. The company has instituted a new program to expand and intensify the activities of the Sales Development Department, which will include a Technical Services Group, reporting to Mr. McLaughlin. Mr. Rivers will be responsible for sales analysis, product scheduling, general sales intelligence and will also appraise market trends and supervise sales policy.

Northern California Section Hears Hoffman Talk on Curing

► The May 8 dinner-meeting of the Northern California Rubber Group held at the Elks Club, Berkeley, Calif., featured an address by Alfred E. Hoffman of the Universal Oil Products Co. who spoke on "The Effectiveness of Antiozonants." Mr. Hoffman stated that while many materials show some effectiveness as antiozonants, the most effective materials reported to date are the N,N′-disecondary alkyl-p-phenylene diamines. These materials are in general several hundred times as reactive toward ozone as the olefinic linkage in SBR and appear to act as sacrificial scavengers, reacting with ozone before it can attack the rubber.

Mr. Hoffman said the ozone resistance imparted to any one polymer by an antiozonant depends upon the polymer structure, antiozonant concentration, re-enforcing agent, curing system and the absence or presence of waxes and processing oils.

The antiozonant requirement of a given stock will depend upon the geometry and conditioning of the sample and upon such test conditions as strain, temperature, ozone concentration and whether the compound is statically or dynamically tested.

The author concluded that only when due consideration is given to all these factors can the maximum results from chemical antiozonants be achieved and the extension of crack-free life of the rubber article from hours to years.

Naugatuck Appoints Mucci

► Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn., has appointed Raymond J. Mucci, formerly a member of the Division's Commercial Development Department, as assistant to the general manager. Mr. Mucci joined Naugatuck Chemical as a research chemist in the research and development department in 1952, and the following year, he was assigned to market research and commercial development. He has a Bachelor of Arts degree in chemistry from the University of Connecticut and a Master's degree in business administration from the Columbia University Graduate School of Business Administration. Mr. Mucci is a member of the American Chemical Society and the Chemical Market Research Association.

Building Masterbatch Facility

► Construction of additional facilities for the manufacture of carbon black masterbatch rubbers at the Port Neches, Texas, plant has been announced by Goodrich-Gulf Chemicals, Inc., Cleveland, Ohio. Scheduled for completion in 1958, the new facilities will cost in excess of $1 million and are designed to produce a new type of dry synthetic rubber containing carbon black. The manufacture of these rubbers will utilize a new process which has been developed in large scale pilot plant operations over the past year and will provide tire manufacturers with a line of high quality, abrasive resistant products, said to be superior to those now available.

H. L. Lawrence

Lyle E. King

DuPont Promotes Lawrence and King

► Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., has appointed H. Logan Lawrence assistant director of sales, succeeding Milton H. Campbell, who has been transferred to the company's International Department. Lyle E. King succeeds Mr. Lawrence as sales manager for elastomers. Mr. Lawrence joined DuPont's Industrial Engineering Division at Deepwater Point, N. J., in 1934 after he was graduated from the University of Missouri with a B.S. degree in chemical engineering. He was transferred to the Rubber Chemicals Division, now the Elastomer Chemicals Department, for neoprene synthetic rubber sales promotion work in 1936 and in 1941, he was assigned to the tire development group at the Rubber Laboratory at Deepwater Point. Mr. Lawrence returned to Wilmington in 1946 as assistant sales manager of the export sales section and in 1949, he was transferred to the company's Boston, Mass., sales office. He returned to Wilmington again in 1953 as assistant sales manager for neoprene and a year later, he was named manager.

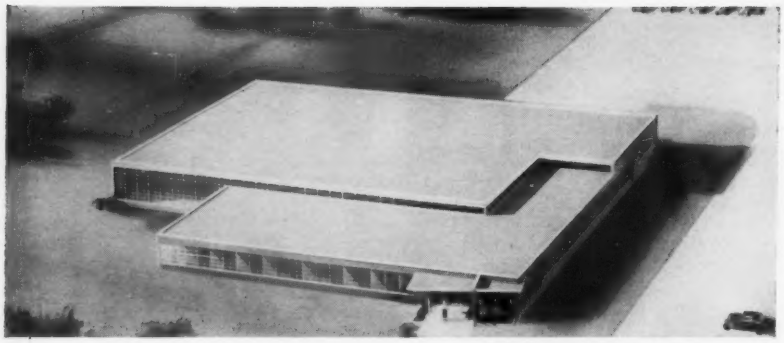
Mr. King joined DuPont in 1945 and for the next three years did engineering consulting work in Wilmington and various plant locations. In 1948, he was assigned to the Economist's Office and in 1954, he was named market research manager of the Rubber Chemicals Division. Mr. King received his B.S. degree in business administration from the University of Nebraska in 1942 and did graduate work there in economics.

N. J. Zinc Curtails Operations

► New Jersey Zinc Co., New York, N. Y., closed down its mine at Hanover, N. M., on May 1 and discontinued roasting operations at the Canon City, Colo., roasting plant on May 15. In addition, there have been substantial cutbacks in production at smelting plants at Palmerton, Penna., and Depue, Ill. A spokesman for the company said that the new curtailments had been made necessary by the continued flooding of domestic markets by foreign zinc. Unrestricted imports, which reached an all-time high in 1957, have created a wholly unrealistic price level for zinc and have resulted in a heavy surplus of metal on the market at a time when consumption has been declining, the company believes. It was further stated that continued absence of action by the Tariff Commission or the government to curb imports had made it impossible to maintain operations at the two western properties and forced the company to lay off hundreds of long-service employees at the Pennsylvania and Illinois smelters.

Videne Plant Underway

► Goodyear Tire & Rubber Co., Akron, Ohio has announced that a general contract for construction of the new $9 million "Videne" manufacturing plant at Apple Grove, West Va. has been awarded to the Catalytic Construction Co. of Philadelphia, Penna. Several key staff assignments have been made in conjunction with construction of the new unit, including appointments of D. E. Lintala as technical superintendent; J. W. Coonen as plant engineer; H. C. Samples as work accountant, and Oka Carlson as plant manager. To be known as the Point Pleasant plant, the five-story structure will produce Videne polyester film which was developed for direct or stretch laminating applications in the textile, metal, wood, paper, plastic, automotive and packaging fields. Work on the new plant will begin immediately on the 300-acre tract at Apple Grove and completion is scheduled for early 1959. Until plant facilities are available, personnel assigned to the Point Pleasant unit will work out of Akron.



Instron Moves To New Plant

► Instron Engineering Corp. has moved from its former quarters in Quincy, Mass., to a new modern plant at 2500 Washington St., Canton, Mass. Located on a 15 acre lot, the single story structure includes 18,000 square feet of manufacturing space and 7,000 square feet for administrative and engineering staff offices. Modern facilities include an engineering library, a cafeteria, a hydraulic loading platform and a 120-car parking lot. Plans for the new building, designed to facilitate production flow, make provision for future expansion.

The company has also announced the appointment of E. J. Tolle as sales manager and Robert O. Smith as production manager. Mr. Tolle was previously associated with Ozalid, a division of General Aniline Film Corp. He is a chemical engineering graduate of Cornell University. Mr. Smith, a graduate of M. I. T., was associated with Bromfield Associates, Boston, Mass., before he joined Instron. Prior to that he had been associated with Pichard and Burns, Needham, Mass.

Goodyear Promotes Three

► Goodyear Tire & Rubber Co., Akron, Ohio, has announced that Richard V. Thomas has been appointed director of international manufacturing and vice-president of the Goodyear International Corp., while R. A. Jay has been named assistant to the president of the parent company. Mr. Jay has been succeeded as head of the Engineering Department by J. D. Peterson, since 1957 manager of electrical engineering. A World War II Air Force veteran, Mr. Thomas attended Amherst College and the University of Indiana before joining the Lighter-than-Air Craft Division in 1943. He served as Tire Division superintendent of Goodyear's plant at Colmar-Berg, Luxembourg, from the time it was opened in 1950 until 1952, when he was transferred to Los Angeles as assistant plant manager. Since 1957, Mr. Thomas has been concentrating his efforts on production and development problems of the Goodyear International organization. Prior to his new appointment, Mr. Thomas was assistant to R. DeYoung, Goodyear executive vice-president.

Mr. Jay joined Goodyear in 1939 following graduation from Iowa State College with a degree in chemical engineering. He served in the Navy during World War II and rejoined Goodyear in 1946 in the factory manager's office. He was named manager of the Goodyear Lincoln plant in 1948 and was appointed manager of the Engineering Department at Akron in 1956. A native of Denmark, Mr. Peterson holds degrees in mechanical and electrical engineering from Purdue University. He joined the Goodyear training squad in 1948 and in 1952 was transferred to Goodyear Aircraft in plant engineering. A year later he joined the Goodyear International organization as manager of engineering at the Uitenhage, South Africa plant. Returning to Akron in 1957, Mr. Peterson was appointed manager of electrical engineering.

Named Chemical Plant Manager

► Earl F. Miller has been appointed manager of the Ashtabula, Ohio, chemical plant for the General Tire and Rubber Co., Akron, Ohio, succeeding P. J. Wallace, who has been named production manager of the company's new synthetic rubber facility at Odessa, Texas. Mr. Miller has had extensive manufacturing experience, having specialized in the technical administrative field. Before he joined General Tire's Manufacturing Analysis Department in Akron, he was executive assistant to the president of Sheller Manufacturing Corp. Born in East Liverpool, Ohio, Mr. Miller attended Mount Union College graduating with a B. S. degree in chemistry. He is a member of the American Chemical Society.

Mr. Wallace had been Ashtabula plant manager since 1956, and previous to that, he served as production superintendent of the faciilty. Experienced in the synthetic rubber production field, he also worked at General Tire's Synthetic Division in the government owned Baytown, Texas, synthetic rubber plant, operated by the company from 1943 to 1954. Mr. Wallace is a native of Jacksonville, Texas, and a graduate of the State Teachers College at Alphine, Texas.

Celebrates 25th Anniversary

► Commodity Exchange, Inc., New York, N. Y., held commemorative ceremonies on May 1 to celebrate its 25th anniversary. Founded in 1933, when the Rubber Exchange, the New York Hide Exchange, the National Metal Exchange and the National Raw Silk Exchange were merged, the Exchange became a legal entity twenty-five years ago, May 1, although formal trading in the futures deliveries of these commodities actually started in the present Exchange's quarters on July 5, 1933. In pointing out the achievements of the Exchange over the past quarter century, a period which saw depression, inflation, World War II, the Korean conflict and government controls, Harold A. Rousselot, president, said that the Exchange's recuperative powers have made it emerge "stronger than ever" in providing facilities for the orderly marketing of products essential to world economy. He said the organization plans to embark on an aggressive drive to make better known its functions and its importance to industry both here and abroad. Jerome Lewine, first president of the firm and one of its founders, said that the Commodity Exchange must ever "remain a symbol of a free enterprise carried on by a free people." Commodity Exchange, Inc., serves as a means for hedging operations for the dealer, producer, consumer, and provides a broader market in commodities traded on a single floor.

Ripple Sole Files Patent Suit

► Ripple Sole Corp., Detroit, Mich., has filed a civil action suit in the U. S. District Court for the District of Massachusetts against American Biltrite Rubber Co., for infringement of its U. S. letters patent 2,710,461 relating to Resilient Shoe Soles. The suit requests an injunction against further infringement and judgment for damages for infringement. The company also reports filing a counter-claim against O'Sullivan Rubber Corp., which requests injunction against further infringement and judgment for damages for infringement of its U. S. letters patent 2,710,461 in the civil action which was begun by O'Sullivan Rubber Corp. in the U. S. District Court, Detroit, Mich., on February 17, 1958, asking to have the patent held not infringed and invalid.

Carter Joins Columbian

► William B. Carter has joined Columbian Carbon International, Inc., New York, N. Y., as staff assistant to the vice-president. Mr. Carter, a 1939 graduate of Grenoble University, France, has had experience in foreign operations in both Europe and Latin America. He was previously associated with the Dewey & Almy Chemical Co. and Godfrey L. Cabot, Inc. Columbian Carbon International represents Columbian Carbon Co. in the international sales of carbon black and iron oxide pigments and also represents abroad other producers of raw materials for the rubber, paint and printing ink industries.

Frank O. Holmes, Jr.

Takes United Carbon Sales Post

► Frank O. Holmes, Jr., formerly associated with W. J. Voit Rubber Corp., has been appointed manager of sales development for the United Carbon Co., Inc., Charleston, West Va. To be headquartered in Akron, Ohio, Mr. Holmes will be in charge of the company's new technical sales service laboratory, now being developed to provide technical services for the rubber industry throughout the country. A native of Boston, Mass., Mr. Holmes has been associated with the rubber industry for 25 years. During the past three years, he served as factory manager for W. J. Voit and earlier, he was technical director for the Armstrong Tire and Rubber Co. Previously, he had been associated with the Goodyear Tire and Rubber Co. in various technical and executive capacities, including service as chief chemist for Goodyear's Swedish operations. Mr. Holmes attended Worcester Polytechnic Institute, Akron University and the University of Cincinnati. He is presently a member of various technical groups including the Amercian Chemical Society and rubber groups in Los Angeles, Akron and Sweden.

Introduces New Amine Catalysts

► American Alcolac Corp., Baltimore, Md., has introduced a new series of amine catalysts for urethane foam manufacture to be sold under the "Sipene" trademark. These catalysts are long-chain fatty tertiary amines and produce urethane foams said to have good physical properties including low compression set values. According to American Alcolac, the catalysts are characterized by high activity (over 95 per cent tertiary amine), high purity and the absence of low level of odor. American Alcolac has a diversity of tertiary amine products with chain lengths ranging from C_8 to C_{18} carbon atoms. In addition to the standard alkyl dimethyl amines, Alcolac has a number of special types such as n-lauryl morpholine and a special odorless amine containing difunctional hydroxyl groups.

Morningstar-Paisley Expansion

► Morningstar-Paisley, Inc., New York, N. Y., is planning to expand its Latex and Plastisol Sales and Technical Departments in order to meet increasing market demand. The first stage of the program has started with an expansion of the plastisol and latex sales and laboratory facilities, plus additional pilot plant equipment at the New York City location. This will be followed by installation of large processing equipment with modern quality control devices at Clifton, N. J., adjoining the firm's Haberland plant. Completion of new facilities is expected by August, 1958. The plastisol line, including organisols, will be tradenamed "Morpasol," and consist of flow-controlled formulations suitable for dipping, rotational and slush molding techniques as well as spray, roller and knife coating types. The latex compounds will be sold under two trade name designations, "Morpalex," a prevulcanized system for safer handling and improved heat and light stability, and "Morpatex," a line of textile latex coating compounds to meet the needs of the upholstery, rug and carpet industry. The company entered the latex and plastisol field in October 1957, when it purchased the Federal Latex Corp. and Federal Chemical Corp. of Brooklyn, N. Y. Samuel Tisser, who headed this operation for Federal continues as manager of the department for Morningstar-Paisley.

Named Becco Division Manager

► Becco Chemical Division of the Food Machinery & Chemical Corp., Buffalo, N. Y., has appointed Dewey H. Nelson, formerly assistant division manager, as division manager, succeeding Frederick A. Gilbert, who was recently appointed general manager of the company's new Inorganic Chemicals Department. Mr. Nelson is a graduate of M. I. T. and was a pilot in the Air Force during World War II. He joined Becco in October, 1947, working first in the company's Special Projects Department and later in the Research Department. In 1951, he was transferred to the Sales Department and in April, 1953, he became midwest district manager in Chicago. Mr. Nelson returned to Becco's Buffalo headquarters in August, 1956, and was named sales manager in November of that year.

Speed Mail Delivery!

► The New York City Office of the Postmaster has advised that for faster, more efficient mail delivery: (1) Zone numbers should be used in all return addresses — they are a part of your address; (2) Local mail should be separated from out of town letters, and (3) Mail should be bundled. It has also been suggested that mail be sent out before noon. The Post Office slogan is, "Mail Early in the Day — It's the Faster Way!"

Grant C. Rickard

Copolymer Appoints Rickard

► Copolymer Rubber and Chemical Corp., Baton Rouge, La., has appointed Grant C. Rickard sales representative to service the southern and southeastern states, with headquarters in Atlanta, Ga. Mr. Rickard attended the University of Louisville at Louisville, Ky., where he majored in chemistry and metallurgy. Afterwards, he became associated with the Reynolds Metal Corp. as chief chemist for the Louisville area. Later Mr. Rickard was transferred to Milledgeville, Ga., and assigned chief chemist and metallurgist for the Naval Ordnance plant operated by that company. He is a veteran of World War II and the Korean conflict.

New Dayton Facility Planned

► Dayton Rubber Co., Dayton, Ohio, has signed an option on a 62 acre site in Springfield, Mo., where it plans to construct a mechanical rubber goods manufacturing plant. To be built on a site a half mile long by a quarter mile wide, the new one story brick and concrete structure will have approximately 175,000 square feet in the manufacturing area and a main building of 700 x 240 feet. A company spokesman said that the Springfield location had been selected after careful checking in 38 cities in six states, because it has an adequate supply of cooling water with a minimum of hardness, and good transportation facilities. Dayton's volume of business has more than doubled in the past ten years through the acquisition or construction of plants in various locations, the company said. In addition to those in Waynesville, N. C. and Dayton, Ohio, the company currently operates plants in Three Rivers, Mich.; Marietta, Ohio; Toronto, Canada and Dundee, Scotland.

► The 1958 Manufacturers' Agents' Guide, which lists more than 10,000 manufacturers who distribute their products through Manufacturers' Agent Publishing Co., 505 Fifth Ave., New York 17, N. Y., has been issued by that organization.

Expands Silicone Products Line

► Silicone Products Department of General Electric, Waterford, N. Y., has announced the addition of three new general purpose silicone rubber compounds containing what are said to be excellent physical properties that meet or exceed MIL-R-5847C Class II specifications. Designated SE-452, SE-472, and SE-482, these rubber compounds have tensile strengths of 800 to 1,400 pounds per square inch, tear strengths of 80 to 200 pounds per inch, and elongations of 250 to 550 per cent. Properly cured parts fabricated from these compounds exceed military specification tensile strength requirements by 23 to 54 per cent. Because of their good physical characteristics which also include very low water absorption and good resistance to compression set, these rubbers are suggested for a wide variety of sealing, gasketing and mechanical applications in the aircraft, automotive, appliance, electrical and other industries.

SE-482 offers greater tensile strength than any other commercially available 80 durometer silicone rubber and is best suited for fabrication by molding and calendering, the company states. It may be blended with the softer SE-452 to obtain compounds of intermediate hardness. SE-472, a 70 durometer hardness stock, and SE-452, a 50 durometer stock, have excellent processing characteristics and are especially suited for fabrication by extrusion. SE-472, which meets the standards of AMS 3357, is well suited for calendering. All three rubbers may be used in extruded service over the temperature range of —75°F. to 500°F. Although manufactured as white compounds, they may be tinted during fabrication to obtain a wide variety of colors.

Introduces Hood S-100 Plus

► Hood Tires, a division of the B. F. Goodrich Co., Akron, Ohio, has announced the development of the new Hood "S-100 Plus" tubeless turnpike safety tire, which is said to withstand the greater stress and strain resulting from sustained driving on super highways. The company claims to have developed an entirely new tire, built around three safety features. Cord plies are built into the tire at a "speedway cord angle" of approximately 30 degrees to the center line of the tread, while other tires have a cord angle of approximately 38 degrees. A high concentration of six plies of specially heat-treated nylon cord provides extra strength and stability for easier steering and the entire tread and shoulders of the S-100 Plus are specially compounded as a single inseparable unit, or "slab". Treads of conventional tires consist of a top-tread and an under-tread firmly bonded together. The new tire also combines such features as a full-depth traction tread; increased resistance to wear and cracking; a chemical agent to counteract deterioration due to weather, and built in tubeless protection against bruise blowouts and quick flats. The S-100 Plus is manufactured in both 14 and 15 inch sizes.

Frederick W. Gage

Appointed Vice-President

► Dayton Chemical Products Laboratories, Inc., West Alexandria, Ohio, has announced the appointment of Frederick W. Gage as vice-president and Lyle E. Calkins as assistant secretary. Mr. Gage joined the firm in 1954 as technical director after having been a research supervisor with the Columbia Southern Chemical Co. for a number of years. He has been prominent in the development and application of non-black reinforcing pigments for rubber compounding and more recently has figured in the development of specialized bonding agents as well as of the base materials going into them. A graduate of Illinois Wesleyan and Northwestern University, Mr. Gage has served as an officer of various technical groups, and at present is a director of the Division of Rubber Chemistry for the American Chemical Society. Mr. Calkins was formerly chief chemist for Willys Motors, Inc., Toledo, Ohio, and later became associated with the Champion Textile Finishing Co., Chicago, Ill. A graduate of Toledo University, he joined Dayton Chemical Products as chief chemist early in 1957.

Gro-Cord Appoints Smith

► Gro-Cord Rubber Co., Lima, Ohio, has appointed Roy A. Smith, who was formerly associated with the Durkee-Atwood Co., as technical director. Mr. Smith was first associated with Gro-Cord in 1946 as a laboratory technician, later serving the company as assistant to the chief chemist. After his initial service at Gro-Cord, he left the organization to further his studies in the field of chemical engineering in Chicago. In 1953, Mr. Smith joined the Durkee-Atwood Co. as production manager of the Shoe Products Division at the Red Wing, Minn., plant. He assumed the duties of chemist and plant engineer in 1956. Mr. Smith is a member of the American Chemical Society, Rubber Division, Chicago Rubber Group.

Study Rubberized Asphalt

► Details of a study on a new process for rubberizing asphalt with natural rubber latex have been disclosed by the Natural Rubber Bureau, 1631 K. St., Washington 6, D. C. A paper entitled "A New Rubberized Asphalt for Roads," by J. York Welborn, director, and John F. Babashak, Jr., chemist, for the NRB research laboratory, published recently in the *Journal of the Highway Division* of the American Society of Civil Engineers, discusses the results of research initiated to develop a method for rubberizing asphalt with natural rubber in latex form and to determine whether certain arbitrary characteristics of the material could be improved.

It was found that by adding small amounts of sulfur to the latex, the blending conditions were improved and the effectiveness of the rubber on the asphalt increased. Compared with blends prepared with latex alone, addition of small amounts of sulfur was said to have reduced time and temperature of blending; improved storage stability; increased low-temperature ductile properties, and increased toughness and tenacity. The study showed that the properties of an asphalt rubberized with natural rubber latex can be changed not only by variation of the amount of rubber but also by utilization of different amounts of sulfur. Based on the asphalt, the amount of sulfur required to produce the above changes was very small, a maximum of 0.6 per cent having been used in this study. It was concluded that the effectiveness of natural rubber in changing the properties of asphalt was greatly increased by the method presented.

Huber Densifying Process

► A new method plus equipment which provide processes for removing occluded air from fine powdered materials have been developed and patented by the J. M. Huber Corp. of Borger, Texas. According to Huber, the densifier makes possible the production of more salable, less dusty products with a uniformly higher density, and affords a positive way of reducing packaging materials and transportation costs. The densifying process is accomplished by the simultaneous application of vacuum filtration and mechanical compression to a regulated and continuously moving product stream. Density control is reliable and simple, and vacuum requirements are surprisingly low, the company claims. It has been used for tonnage production of materials such as kaolin clays, 75 per cent DDT concentrates, metallic oxides and silica pigments. In actual commercial practice, the density of these materials has been increased as much as 100 to 200 per cent. Manufacture and use will be licensed by Huber to any company interested. The densifier has already been proven in a number of commercial applications made by Huber and other manufacturers who have taken a license for its use. Huber has a pilot densifier for processing sample materials for study and evaluation by those interested in the process.

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To match the most precise specifications for achieving optimum balance ... Columbian produces Furnex ... semi-reinforcing furnace black. For *any* requirement where rubber with special characteristics is desired ... Columbian's wide range of other blacks assures superior results. Extensive research on carbon black characteristics ... plus precise production control ... enable Columbian to provide the perfect carbon black for every requirement.

COLUMBIAN CARBON COMPANY

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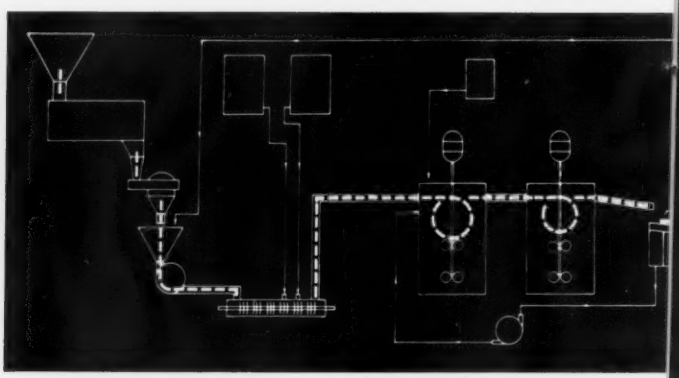

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Columbian is responsible for so many major steps ahead... developments like the latex masterbatching process which has spurred the whole industry to vital new progress!

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Columbian has a carbon black for every need.

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STATEX-B FF Fine Furnace
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STATEX-93 HMF High Modulus Furnace
STATEX-G GPF General Purpose Furnace
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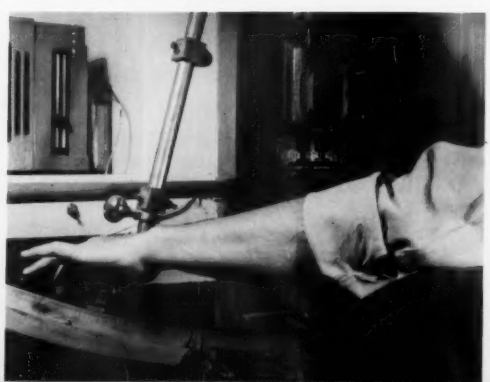

COLUMBIAN CARBON COMPANY
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Named Westvaco Division Manager

► Westvaco Mineral Products Division of the Food Machinery and Chemical Corp., New York, N. Y., has announced the appointment of Raymond F. Moran, previously resident manager of the Newark, Calif., plant, as manager of the division. The company has also announced that Raymond C. Tower has been named sales manager while Michael S. Cimino has been named resident manager of the Newark plant, succeeding Mr. Moran. Resident manager of the Newark plant for the last six years, Mr. Moran also supervised the division's plant at Chula Vista, Calif., and its dolomite mine at Hollister, Calif. He became associated with Westvaco at its Charleston, W. Va., plant, where he served as process control superintendent. Later he was assigned to Division headquarters in New York. Mr. Moran is a graduate of the Cooper Union School of Engineering and is a member of the American Chemical Society and the American Institute of Chemical Engineers.

Raymond C. Tower has spent twelve years with the division in research and sales positions. His most recent assignment was as manager of phosphate sales. Previously, he was district manager in the New York area and earlier, he specialized in sales of barium chemicals, chlorinated solvents and insecticides. Mr. Tower is a graduate of Yale University and is a member of the Salesmen's Association of the American Chemical Industry and the Air Force Chemical Association. Mr. Cimino becomes resident manager of the Newark plant after spending the last six years there as general plant superintendent. He is a graduate of the University of California and is a member of the American Institute of Chemical Engineers.

Midland-Ross Buys Hartig

► Midland-Ross Corp., Cleveland, Ohio, has acquired the Hartig Engine and Machine Co., Mountainside, N. J., for $1,200,000 in cash as a part of the company's long-range program to broaden operations. Edward Greene, president of Hartig and principal shareholder, will continue as the operating head of the firm which will become a division of Midland-Ross. Hartig, a major manufacturer of plastic extruding machinery for production and forming of thermoplastic materials, was founded in 1890 and incorporated in the State of New Jersey in 1916. The company's extruding machinery which has been built in the past three years is said to be capable of producing over one billion pounds of the over-all total of four billion pounds of the finished plastic turned out in 1957. Midland-Ross is a producer of automotive frames, brakes and other related components and atmospheric control systems. Formed late in 1957 through the merger of the Midland Steel Products Co., Cleveland, Ohio, and J. O. Ross Engineering Corp., New York, N. Y., the company operates four divisions including the Cleveland, Detroit, Owosso (Mich.), and J. O. Ross Engineering Divisions.

Atlas Opens New Technical Center

► Recent dedication ceremonies marked the opening of a $3 million Technical Center which has been constructed to house the Chemical Research and Product Development Departments of the Atlas Powder Co. of Wilmington, Del. A two-story and partial basement structure, the new L-shaped building contains 70,000 square feet of floor space. The building was designed and constructed of materials in harmony with the company's nearby general office building. The Chemical Research Department conducts long-range research on various raw materials, chemical reactions, and scientific concepts designed to discover new products and processes for the company. This department also is responsible for atomic research interests, through Industrial Reactor Laboratories, Inc., which Atlas and nine other companies are sponsoring.

The Product Development Department is responsible for finding new uses for products and new products to serve present and future markets. The laboratory staff of the department is organized into groups composed of people with specialized knowledge and experience in their particular industry such as Darco activated carbons, industrial processing materials, oil production and refining chemicals, paint, plastics, and many others. The new Technical Center is equipped with the latest scientific instruments and facilities and contains two separate air-cooling systems—one serving the office and lobby area, and a second supplying fresh air to laboratories. The working force of the Technical Center includes more than 100 laboratory professionals and more than 50 laboratory technicians and other personnel.

Plans Anthraquinone Facility

► American Cyanamid Co., New York, N. Y., has announced plans to construct a multi-million dollar anthraquinone manufacturing facility at its Bound Brook, N. J., plant, at which a completely new process developed by the company's research laboratories will be utilized. To be operated by the Organic Chemicals Division, the plant will replace and expand existing anthraquinone facilities and will also provide additional production capacity for making methyl anthraquinone, naphthoquinone and phthalic anhydride. With its completion, it is believed that Cyanamid will become the only commercial producer of naphthoquinone in this country. An outdoor-type continuous processing installation with panel-board control, the new plant will cover approximately two acres. Its new manufacturing process, known as the "naphthoquinone process," involves the direct oxidation of naphthalene in a fixed bed catalytic converter. Development work on the process has been in progress for about six years and its practicality has been successfully demonstrated in pilot plant operations. Cyanamid's Engineering and Construction Division will supervise the design and construction of the new anthraquinone plant which is expected to be completed late in 1959. Design provides for expansion in the future.

Goodyear Vitel Polyester Resin

► Goodyear Tire & Rubber Co., Akron, Ohio, has introduced a new polyester resin for use in the manufacture of synthetic fibers which will be produced under the name of "Vitel". One of a family of resins, the new polyester is an orientable crystallizable, linear copolyester and will be produced by Goodyear in a new $9,000,000 facility at Apple Grove, West Va. The new unit, designated the Pt. Pleasant plant, will be located on a 300 acre tract and is expected to be on stream early in 1959. Plans call for a five story structure with approximately 100,000 square feet of floor space. H. R. Thies, general manager of the Goodyear Chemical Division, will direct marketing of the resin.

Goodyear claims that adaptation of this resin for textile applications represents a unique step in the synthetic fiber industry since production of the resin and production of the fiber will be non-integrated operations. While Vitel will be produced at Pt. Pleasant, actual spinning will be done by Beaunit Mills, Inc., a fiber producer. Beaunit Mills has begun construction of a $10,000,000 plant for the sole purpose of spinning fiber from Vitel. The unit will employ 300 workers and will have an annual capacity of 10 million pounds of the fiber, including staple, tow and yarn spun from tow.

URW Opens Annual Wage Drive

Union Seeking Adequate Pay Raises, Improved Fringe Benefits and Supplemental Unemployment Payments

► The AFL-CIO United Rubber Workers Union has opened its annual wage drive in the rubber industry seeking substantial and adequate pay raises, improved fringe payments and increased supplemental unemployment benefits. At the same time, the rubber "Big Four," B. F. Goodrich, Firestone Tire & Rubber, Goodyear Tire & Rubber, and U. S. Rubber, has urged the union to consider a proposal for a year-long industry-wide pay freeze. The proposal was turned down at a conference of the union's 156-man International Policy Committee in Cincinnati last month.

L. S. Buckmaster, URW general president, said the rubber companies should "join with us in rejecting pessimism" and accept as fact that the prosperity of the industry has been due in large measure to union wage and fringe gains that have enabled workers to buy more. Mr. Buckmaster stated, "We cannot accept your proposition that we can work our way out of a depression by lowering the purchasing power of the wage earners or anyone else. We are convinced that a general wage increase and more adequate retirement benefits will stimulate employment by putting badly needed dollars into the hands of consumers. In turn, those dollars will put reality into the 'Buy Now' campaign which I am sure you endorse."

Pay Freeze Request

The request for the pay freeze was made by the industrial relations directors of the Big Four in identical letters sent to Mr. Buckmaster. The joint statement read, "It is our opinion, essential to both the immediate and long-term welfare of our employees and the company" to freeze wages and fringe benefits. A further drop in sales, less production and fewer jobs will be the result of an increase in wages.

Mr. Buckmaster, who is the spokesman for more than 100,000 union members in the rubber industry in the United States, claims that his union does not believe the "Big Four rubber companies are in serious financial difficulties." Explaining his union's rejection of the one-year pay freeze, Mr. Buckmaster said, "It is not true the rubber industry 'is one of the hardest hit in this business slump.'" He was quoting letters from the Big Four suggesting the wage moratorium and expressed these comments in a written reply on May 15 to the Big Four. He chided the companies for giving their "story" to the press. While the companies have this right, Mr. Buckmaster said, "we do not believe this is a proper way to maintain a collective bargaining relationship." He added the URW will do most of its talking at the bargaining table. "Our union finds itself in complete disagreement with several conclusions and inferences expressed by the companies . . ."

The union has also served a required second 60-day notice on Goodyear, covering a separate pension and insurance agreement. The union gave Goodyear the first 60-day insurance and pension notice in February and bargaining started March 19. Talks have been recessed since April 3. The union has served an initial 60-day pension and insurance notice on Goodrich. Meantime pension and insurance talks between the URW and Firestone have been recessed after three weeks of bargaining.

Price Hikes Indicated

In their letters to Mr. Buckmaster, the companies indicated another round of pay raises could not be shouldered by the industry without a price hike and/or more layoffs. Higher prices also would produce a further drop in sales, the companies believe. "Higher unit labor costs," they said, "have been a major cause of higher prices which the consuming public is now showing its unwillingness to pay." Last summer, the URW got a 15-cent hourly pay raise package from the major companies. It was followed by an increase in tire prices.

The Big Four said the dropoff in automobile sales has seriously affected tire business and auto-associated product lines. Many other product lines have been even more severely affected. As a result, they declared, thousands of employees are now on layoff. A July deadline has been set for talks in the three-year master contract which is open for revision of wages this year. The rubber firms proposed that negotiations be postponed until after a current three-year master contract with the union expires in April, 1959.

The letters to Mr. Buckmaster revealed that the Big Four had met with URW representatives in May prior to a conference of the union's International Policy Committee at which its bargaining program was drafted. The meeting was held at the request of the companies "to discuss the prevailing business situation as it relates to the rubber industry. Certainly at this time when our mutual efforts should be directed toward the goals of increased business activity and more jobs in our plants, your committee will want to make a most careful appraisal of the facts," the Big Four said.

The companies suggested that discussion of economic matters be undertaken only at the expiration of the current uniform agreement in April of 1959, when they may be considered in the light of the then prevailing economic conditions. Mr. Buckmaster was told that wages and benefits provided for employees in the four major rubber companies are now among the highest enjoyed by industrial wage earners anywhere in the world. The firms said the average current straight time hourly pay for URW employees is $2.51 and average cost of fringe benefits amounted to 68 cents an hour, representing a total compensation of $3.19 an hour.

The Big Four told Mr. Buckmaster that hourly employment benefits have increased 7 per cent annually in the last three years. They said this is substantially greater than that received by most other employees in American industry and is almost as great as the increase in the cost of living during this period. The firms said the pay boosts have not only been exorbitant, but they have also seriously damaged the competitive position in non-tire plants where wages of major competitors are lower, they added.

Should another increase in costs occur, the companies said they anticipate a further drop in sales, less production and fewer jobs—at least temporarily in all of their operations and undoubtably on a permanent basis in some. It seems clear the most important thing to do at this time, the companies said, is to strive to protect the jobs of our remaining employees and to return to work as soon as possible those who have been laid off due to the present level of business.

Goodyear Makes Statement

In a separate statement, Goodyear said it was "surprised and disappointed" that the union saw fit to open contract negotiations with the object of increased wages and fringe benefits in the light of the present recession. Goodyear officials stated that "Any further increase in the cost of wages and fringes could not be absorbed by the company with a further reduction of earnings or without increasing the prices of our products, which would place an added burden on the consumer.

Mr. Buckmaster claimed the drop in sales and profits for the Big Four during the first quarter of 1958 is "simply a falling away from the extremely high levels reported by these same companies for 1957. Compared with any normal year, sales and profits for the first quarter of 1958 are surprisingly good." He cited Goodyear as an example, saying if that company—largest in the industry—does as well in the last three quarters of 1958, "it will show a net profit for the current year of more than $40,000,000."

A. C. Groce

Harwick Sales Representative

► Harwick Standard Chemical Co., Akron, Ohio, has appointed A. C. Groce as sales representative covering the southeastern section of the United States. A native of South Carolina, Mr. Groce, will have his headquarters in Greenville, S. C., where the company will also maintain warehouse facilities. Mr. Groce has had experience in the textile industry and with chemicals for the textile, paint, rubber and allied industries. He is a member of the Southern Rubber Group, the Rubber Division of the American Chemical Society, the American Association of Textile Chemists and Colorists, the Southern Textile Overseers Association and the American Water Works Association. Mr. Groce served with the U. S. Army Air Force during World War II.

Materials Handling Conference

► Materials handling problems in the atomic and space age will be among the topics featured during the Materials Handling Conference sponsored by the American Society of Mechanical Engineers and to be held at the Public Auditorium in Cleveland, Ohio, June 9-12. The conference will be held concurrently with the National Materials Handling Exposition, produced by Clapp and Poliak, Inc., New York exposition management firm. More than 100 basic types of machinery will be shown. The session devoted to handling the atom-space age will feature papers on the handling of radioactive materials, ground handling and launching problems of space ships, and special ground support equipment for handling rockets and missiles. Other meetings will highlight the need for cost reduction in the nation's factories and distribution systems; new developments in materials handling systems; equipment maintenance, and scientific management in materials handling.

► The rubber industry sales offices of the Textile Fibers Department of E. I. du Pont de Nemours & Co., Inc., have been moved to new quarters at 191 South Main St. in Akron, Ohio.

U. S. Rubber Clarkson Cord Former

► A machine that automates production of nylon or rayon tire cord has been invented by R. J. Clarkson, a textile development engineer for the U. S. Rubber Co., New York, N. Y., Named the "Clarkson Cord Former," the new machine is said to perform in a single operation a cord forming and winding job conventionally done by three separate machines and also operates at approximately twice the speed of standard tire cord twisting machines, producing a large precision-wound package. The company states that more than a year's experience with the new 48-spindle production machine indicates that it will save 54 per cent in floor space; requires 62 per cent less manpower; cuts the number of knots in tire cord by 75 per cent; reduces waste by 77 per cent, and lowers investment for additional capacity by 44 per cent.

Now in pilot operation at the Winsboro plant of the company's Textile Division, the machine's limitations are that it can produce only a two-ply tire cord cable and it can be used only with multi-filament yarn such as nylon or rayon. Mr. Clarkson first began work on the machine in 1941, put the project aside during World War II and took it up again in 1948. The current 48-spindle machine is the fifth prototype that has been constructed. U. S. Rubber holds a patent on the Clarkson Cord Former, but has announced that it will license other firms to use it.

Dunlop Gold Seal Tire

► Dunlop Tire and Rubber Corp., Buffalo, N. Y., has announced the addition of a premium quality nylon passenger car tire to the company's line. Named "Gold Seal", the new tire has been designed especially for nylon and is available in 14 and 15 inch sizes with either black or white sidewalls. The new tire features of Cobra Curve tread design, a combination of traction elements which adjust automatically to changing driving and road conditions, and is said to excel at routine functions while it also increases directional stability and eliminates side-slip. According to Dunlop, wide, husky shoulder ribs and circumferential siping prevent uneven tread wear; wide outside ribs and their continuous sipe eliminate corner squeal caused by tread vibration and the tire's solid, unsiped, serrated center rib maintains directional stability. The Gold Seal carries a two and one-half year road hazard guarantee.

Keating in Accident

► J. Roy Keating, sales representative for the Columbian Carbon Co. and widely known in the rubber industry, was severely injured in an automobile accident while driving to his home early in May. Among other injuries, Mr. Keating suffered a fractured pelvis in the accident. It is expected that Mr. Keating will return to his home for a period of convalescence shortly.

Hamilton Ruth

Joins Huber Sales Force

► The Industrial Products Department of the J. M. Huber Corp., New York, N. Y., has appointed Hamilton Ruth to the company's Rubber Division sales force, with headquarters in Akron, Ohio. Mr. Ruth, who received his education in Baltimore, Md., previously served four years in the Air Force as a crew chief and is a commercial pilot.

Mohawk Stockholders Meet

► Mohawk Rubber Co., Akron, Ohio, has announced that at the annual stockholders' meeting the company re-elected its board of directors and officers and doubled the number of authorized shares of common stock. The number of authorized shares was raised from 172,500 to 350,000. There are 144,533 shares outstanding. The increase in shares is intended to provide additional equity financing at a future date and to provide shares for additional stock dividends in the event the company's earnings warrant such dividends. A recommendation by the directors that the no par stock be changed to $1 par value stock was also approved by stockholders. In 1958, the company plans to conduct an intensified sales effort, to have better field warehousing, speedier distribution and to carefully control inventories and conserve working capital.

Chemore Offers Moplen

► Chemore Corp., New York, N. Y., general representative in the United States and Canada for Montecatini Societa Generale, Milan, Italy, has announced that "Moplen" polypropylenes are now available in 19 different colors plus natural in truckload quantities. Available in pellet form for injection molding and extrusion, specially formulated compounds of Moplen may be obtained for other applications. Among the colors available in this country from stock are flame red, sky blue, turquoise and green. Other standard colors available upon request are white, ivory, cream, yellow, pink, red, gray-green, light blue, ultramarine, slate blue, blue, Nile green, tan, gray and dark gray.

Names in the News

John E. Hewson, formerly manager of the Tulsa, Okla., office of the Foxboro Co., has been appointed manager of the New York sales region succeeding **E. H. Huckman,** who recently assumed the position of assistant field sales manager for the firm. **D. T. McElligott** has been named manager of the Tulsa branch.

Orville W. Taylor, who joined the company in 1950, has been assigned a senior engineer of the Henry, Ill., General Chemicals Plant of B. F. Goodrich Chemical Co.

Thomas L. Denney, formerly special assistant to the vice-president marketing, has been appointed sales manager of the Garlock Packing Co. of Palmyra, N. Y.

William J. Fritton, marketing vice-president of the U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y., was elected to the board of directors at the company's annual stockholders' meeting.

Curtis L. Moody, production planning manager for the Tire Division of the U. S. Rubber Co., has retired after 28 years of service.

Dr. Herman Sokol, formerly in charge of research and development, has been named executive vice-president of the Heyden Newport Chemical Corp., New York, N.Y.

C. Jay Parkinson, general counsel of Anaconda Wire & Cable Co., New York, N. Y., has been elected vice-president and a director of the firm.

Dr. Maurice H. Bigelow, formerly technical director, has been appointed vice-president of the Barrett Division of the Allied Chemical Corp., New York, N. Y.

Claude R. Mason, formerly service manager, has retired after more than 50 years of service with the B. F. Goodrich Tire Co., Akron, Ohio.

Robert G. Colvin, treasurer of the Kirkhill Rubber Co., Brea, Calif., has been elected to membership in the Controllers Institute of America.

William R. Willets, assistant manager of technical service laboratories of the Titanium Division, National Lead Co., New York, N. Y., has been awarded a gold watch in recognition of 25 years of service with the company.

William N. Cargile has been named general sales manager of American Latex Products Corp., a subsidiary of Dayton Rubber Co., succeeding **Lewis C. Pape** who has been named general sales manager in charge of foam for the parent company.

George Mastel, formerly associated with Boulay, Anderson, Waldo & Co., has been appointed controller of the Minnesota Rubber Co., while **Craig S. Kirkpatrick,** previously with Minneapolis Moline, has been named advertising manager and director of public relations.

Alice Josephine Gitter has been named director of market research for the United Mineral & Chemical Corp.

George L. Fox, previously in the Research Department of the Mobay Chemical Co., has been transferred to the Product Development Department at the company's central offices in Pittsburgh.

Gavin A. Taylor, who has served as assistant manager for the Butyl Division of the Enjay Co. since July, 1956, has been appointed manager of export sales–Europe for the company.

Kenneth H. Wanderer, formerly supervisor of management plant and controls in the Controllers Department of Food Machinery and Chemical Corp., has been appointed controller of the company's Chemical Divisions.

Joseph L. Bearden, associated with Goodrich since 1934, has been named superintendent of consolidated plants 1, 2 and 4, Akron, Ohio, for the B. F. Goodrich Industrial Products Co., succeeding **Lee D. Tidball,** who assumes responsibilities for special assignments.

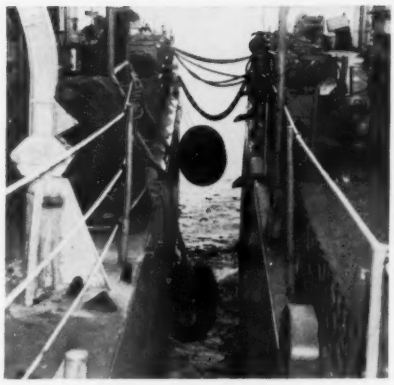
James M. Gavin, formerly Army Chief of Research & Development, has been elected a vice-president and director of Arthur D. Little, Inc., Cambridge, Mass.

Edward W. Galloway, formerly assistant manager of the Savannah, Ga., titanium dioxide plant of the Pigments Division of American Cyanamid Co., has been appointed sales manager of the Division.

Harry M. Dent, Jr., has been appointed a district sales manager for the Durez Plastics Division of Hooker Electrochemical Co., North Tonawanda, N. Y.

Harold B. Wright has been appointed to the new post of commercial products sales manager of the Royalite Chicago plant of the U. S. Rubber Co.

George M. Sprowls, formerly manager of the Highway Transportation Division of the Goodyear Tire & Rubber Co., has been appointed director of research of American Rayon Institute, Inc., New York, N. Y., and **John D. Hallaren,** previously director of public relations for the American Rayon Institute, has been named to the newly created post of director of the Tire Cord Division.



Goodyear Pneumatic Ship Fenders

► Goodyear Tire and Rubber Co., Akron, Ohio, has developed pneumatic ship fenders, shaped like barrels and built like automobile tires, for use by the U. S. Navy to protect ship hulls. The fenders act like giant air cushions, absorbing shocks when two ships or a ship and dock come together. A pneumatic ship fender is built a great deal like a premium grade passenger car tire, but with a wider carcass and a smaller steel bead diameter. Metal plates are built in the ends and equipped with swivels so the fenders will roll with a ship, providing cushioning. Navy officials ordered the new type fenders to protect the hulls of a destroyer fleet nested at Atlantic fleet headquarters in Rhode Island. When the first pneumatic fenders were delivered, they were successfully applied in working fleet operations. Use of the pneumatic fenders enables Navy ships to remain nested together without damage during severe storms, at which times it had been customary to dispatch destroyer fleets away from docking or nesting areas. The company claims that this is no longer necessary in most cases.

Converts Rayon Cord Production

► American Viscose Corp., Philadelphia, Penna., has begun a program to convert its rayon tire yarn spinning capacity to the production of "super super" type yarn. Avisco claims that recent development work indicates the superiority of this type yarn for certain tire body constructions and that the trend in tire manufacturing is in the direction of lighter weight and stronger yarns. The company stated that the lighter weight yarn has improved characteristics of higher fatigue and strength, making it possible to construct a tire of greater carcass strength with lighter body weight, which is said to result in a cooler running and easier riding tire. According to American Viscose, the new rayon yarn in 1100/2 construction is just about 50 per cent stronger than previous type cords and has a fatigue improvement of several times that amount. The company has been supplying this new yarn in limited quantity for some time and plans to convert all facilities to this type, ultimately eliminating previous yarns. It is estimated that conversion work will require several months for completion.

NSC Announces Award Winners in Rubber Section Contest

► The Rubber Section of the National Safety Council, Chicago, Ill., has announced the award winners in the 1957 safety contest conducted among 159 companies in the rubber industry. A total of 384,194,000 man hours of work were amassed by the companies competing in the contest. Of the 159 entries in 1957, 26 of them ended the season with perfect records entitling them to receive first place from the National Safety Council.

Along with the announcement of the winners in each of the divisions, NSC also disclosed that the 989 injuries reported by the rubber companies during the contest year represented a 17 per cent decrease compared with 1956. As noted in the table that appears elsewhere on this page, the rubber companies had an overall accident frequency rate of 2.57, which is 6 per cent less than the frequency rate in the preceding year. NSC also reported that the rubber companies had an 11 per cent decrease in the total manhours of work compared with 1956.

A tie for first place in Division I was shared by the U. S. Rubber Co. Mishawaka, Ind. plant and the Firestone Pottstown, Penna. facility. In Division II, the Providence, R. I. plant of U. S. Rubber and Dominion Rubber Co., Ltd., St. Jerome, Que., Canada, plant copped first places. Simplex Wire & Cable Co., Cambridge, Mass., was Division III winner.

A six-way tie for first place in Division IV saw the Akron, Ohio and World Bestos Division, New Castle, Ind., plants of the Firestone Tire & Rubber Co. win two of the plaques. First place awards in Division IV also went to the American Synthetic Rubber Corp. Louisville, Ky. plant; U.S. Rubber Tacony, Penna. plant; Hewitt-Robins, Inc., Buffalo, N. Y. plant, and the Buena Vista, Va. plant of Duroflex, Inc.

A fifteen-way tie for first place resulted in the Division V competition, with Firestone taking four of the top honors, and B. F. Goodrich and Goodyear Tire each taking three of the top prizes. First place plaques in this division were also awarded to the U.S. Rubber Santa Ana, Calif. plant; Canadian Lastex, Ltd., Montreal, Que., Canada; the Middleboro, Mass. plant of the Lobl Manufacturing Co., Division of the Faultless Rubber Co.; General Shoe Corp., Nashville, Tenn., and Gates Rubber of Canada, Ltd., Brantford, Ont., Canada.

Petro-Tex Building Isobutylene Plant

► Petro-Tex Chemical Corp. of Houston, Texas, has announced that construction has begun on a new high-purity isobutylene plant with a capacity large enough to supply a substantial part of the present market for the material. Output will be above 99 per cent purity, the company states, and will be available in pressure type tank cars in December of this year. High purity (99 per cent plus) isobutylene heretofore has been available from only one other source in connection with butyl rubber production.

Petro-Tex is of the opinion that a high purity production will have a fairly wide market in polymers and in alkylated compounds. Currently a major supplier of butadiene and other olefins, Petro-Tex Chemical Corp. is jointly owned by the Tennessee Gas Transmission Co. and the Food Machinery and Chemical Corp.

Kohinor 652 Resin Approved

► Eleanora Chemical Division of the Pantasote Co., Passaic, N. J., has announced that "Kohinor 652," dry blending vinyl chloride resin has been recognized by the Underwriters Laboratories as an "interchangeable basic resin," and that concurrently, the Laboratories also recognized Kohinor W-200 compound for types T, TW, 60°C and 80°C. insulation. Kohinor 652, widely used in the calendering and extrusion field, has proven to be an outstanding resin in all respects, the company states. Its speed of dry blending in ribbon, intensive and Muller type mixers has made this resin particularly attractive to vinyl resin users. Underwriters recognition of Kohinor 652 makes it possible for the wire and cable industry to benefit from the outstanding properties of this resin, according to Pantasote.

New U. S. Rubber Tire Line

► A new line of low-priced nylon cord tires for panel, pickup, delivery and large over-the-highway trucks has been introduced by the U. S. Rubber Co., New York, N. Y. Extra heavy rubber compounds have been used to insulate the nylon cord in the new "U. S. Royal" delivery truck tires, and sizes with 8-ply rating and up are made with nylon cord having a tensile strength of 53 pounds. Standard nylon tire cord has tensile strength of 27 pounds. The new tires range in size from 6:00-16 to 10:22 in tubed construction, while tubeless sizes are 6:70-15 and 6:50-16.

Offers Cydac In Flaked Form

► The Rubber Chemicals Department of American Cyanamid Co., New York, N. Y., has developed a flaked form of N-cyclohexyl-benzothiazole-2-sulfenamide accelerator, said to be one of the most widely used delayed-action accelerators in the rubber industry. On the market for a number of years, Cyanamid's flaked product, "Cydac" accelerator, is designed to eliminate the caking usually associated with currently available forms. Its free-flowing properties are expected to be of particular advantage in the automatic compounding of rubber for tire treads, footwear, heels, soles and similar products. This new addition completes Cyanamid's line of rubber accelerators, which range from the very fast-curing mercaptobenzothiazole to the safest delayed action DIBS accelerator. In processing safety, the new product occupies a position between the MBTS and NOBS accelerators. Cydac accelerator has a typical melting range of 203-212°F. and a specific gravity of approximately 1.25. It also is less than 1.0 per cent Methanol insoluble and disperses readily under ordinary mixing conditions at temperatures as low as 150°F.

Eddy Named Chemicals Manager

► Richard W. Eddy, formerly assistant manager, has been promoted to manager of the New Chemicals Division, Union Carbide Chemicals Co., New York, N. Y. Mr. Eddy joined Union Carbide as a chemist at the South Charleston, West Va. Research Laboratories, following graduation from Ohio University with a B.S. degree in chemistry in 1940. From 1942 to 1945, he served in the Chemical Corps of the U. S. Army, and from 1946 to 1948 he attended Massachusetts Institute of Technology, from which he received an M.S. degree in organic chemistry. Mr. Eddy holds professional affiliations with the Armed Forces Chemical Association, the American Chemical Society, Synthetic Organic Chemicals Manufacturing Association, Society of the Chemical Industry, and the Commercial Chemical Development Association. He is a member of the Chemists' Club of New York and the M. I. T. Club of New York.

Rubber Industry Accident Frequency Rate in 1957

Division	Average Monthly Manhours	Jan.-Dec. Frequency Rate	Per Cent Change from Jan.-Dec. 1956
Division I	over 400,000	1.96	+13
Division II	200,001—400,000	2.34	—19
Division III	100,001—200,000	2.47	—30
Division IV	50,001—100,000	6.06	—13
Division V	under 50,000	5.73	—17
Total, all Divisions		2.57	— 6

Financial News

Wyandotte Chemicals

► Quarter to March 31: Net income of $114,000, which equals a loss of 1c per 1,421,563 common shares after preferred dividends of $133,000, compared with $904,000 or 54 cents a common share after preferred dividends of $135,000, in the first quarter of 1957. Sales in the first three months of 1958 totaled $16,789,000 compared with $19,454,000, during the same period last year.

Columbian Carbon

► Quarter to March 31: Net income of $1,132,187, which is equal to 70c per share, compared with $1,631,838, or $1.01 a share, in the corresponding three month period of 1957. Sales and other income in the first quarter of this year totaled $16,322,960 compared with $19,418,814 in the first quarter last year.

Pittsburgh Coke

► Three months ended March 31: Net income of $210,000, which is equal to 9c per common share, compared with $908,000, or 70c a share, in the first three months of the previous year. Sales in the first quarter of 1958 totaled $10,265,000 compared with $13,681,000 in the corresponding period of the preceding year.

Mansfield Tire

► Quarter to March 31: Net income of $265,144, which is equal to 42c per common share, compared with $214,694, or 32c a share, in the first three months of 1957. Sales in the first quarter of this year totaled $13,627,025, compared with $12,041,986, in the corresponding period of the preceding year.

Armstrong Rubber

► Six months to March 31: Net income of $955,062, which is equal to 61c a common share, compared with $984,214, or 63c a share, in the first half of the preceding year. Sales in the six month fiscal period to March 31 totaled $32,467,265, compared with $31,998,761 during the same period last year.

Triangle Conduit

► For 1957: Net income of $3,481,631, which is equal to $2.56 per share, compared with $3,511,860, or $2.58 a share, the year before. Sales in 1957 totaled $56,299,223 compared with $55,050,938 in 1956.

New Jersey Zinc

► For 1957: Net income of $1,227,047, which is equal to 63c per share, compared with $2,570,650, or $1.31 a share, in the preceding year.

Eagle-Picher

► Three months ended February 28: Net income of $504,834, which is equal to 50c a share, compared with $1,364,318, or $1.36 a share, in the first quarter of 1957. Sales in the first fiscal period of 1958 totaled $24,201,133, compared with $31,862,756 in the corresponding period a year ago.

U. S. Rubber Reclaiming

► For 1957: Net income of $57,595, compared with $101,243 the year before. Sales in 1957 totaled $4,708,524, compared with $4,723,701 in 1956. Earnings are before special charges of $4,230 in 1957 and $392,431 in 1956.

Clevite

► For 1957: Net income of $3,988,539, which is equal to $2.08 per common share, compared with $3,971,593, or $2.06 a share in 1956. Sales in 1957 totaled $71,368,224 compared with $73,581,604 the year before.

Mansfield Tire

► For 1957: Net income of $1,522,957, which is equal to $2.50 per common share, compared with $1,376,683, or $2.23 a share, in the preceding year. Sales last year totaled $59,722,211, compared with $61,557,595 in 1956.

Cooper Tire

► For 1957: Net income of $270,757, which is equal to $1.00 per common share, compared with $410,389, or $1.60 a share in the preceding year. Sales last year totaled $24,473,277 compared with $23,737,387 in 1956.

Kleinert Rubber

► For 1957: Net income of $555,877, which is equal to $1.87 per share, compared with $523,291, or $1.74 a share, in 1956. Sales last year totaled $12,742,147, compared with $12,381,995, in the preceding year.

Anaconda Wire

► For 1957: Net income of $4,972,094, which is equal to $5.89 per share, compared with $9,624,274, or $11.40 a share, in the preceding year. Sales in 1957 totaled $125,602,416, compared with $159,352,097 in 1956.

Pantasote

► For 1957: Net income of $320,985, which is equal to 55c per share, compared with $104,768, or 12c a share in 1956. Sales last year reached a record high of $5,579,625 compared with $4,418,284 in 1956.

U. S. Rubber

► Quarter to March 31: Net income of $3,890,699, which is equal to 45c per share of common stock, compared with $8,179,761, or $1.20 a share, in the first three months of 1957. Sales in the first quarter of 1958 totaled $196,280,095, compared with $232,224,961 during the same period last year.

Borden

► Quarter to March 31: Net income of $4,213,057, which is equal to 87c per share, compared with $4,640,986, or 95c a share, in the corresponding quarter of the preceding year. Sales in the first three months of 1958 totaled $218,975,212 compared with $221,701,044 at the same time last year.

Goodall Rubber

► For 1957: Net income of $572,002, which is equal to $1.20 per share, compared with $669,289, or $1.41 per share, in 1956. Sales in 1957 were the highest in the history of the company, totalling $12,202,648, compared with $12,004,489, in the preceding year. The decline in 1957 profits was due to increased costs not reflected in increased selling prices.

General Tire

► Three months ended February 28: Estimated net earnings of $1,754,124, which is equal to 30c a share of common stock, compared with $3,250,400, or 65c a share, in the first quarter of the preceding year. Sales in the first quarter of 1958 totaled $96,565,835 compared with $95,497,316 in the same period of 1957.

Carlisle

► For 1957: Net income of $1,019,958, which is equal to $1.78 per share, compared with $904,448, or $1.60 a share in 1956. Sales last year totaled $19,353,704 compared with $17,960,941 the year before. Included in 1957 net income figure is a credit of $108,240 from the sale of real estate.

Acushnet Process

► Year to December 29: Net income of $507,294, which is equal to $2.00 per share, compared with $717,256, or $2.95, the year before. Net sales in fiscal 1957 amounted to $14,908,553, compared with $13,935,016 in the preceding year. Net income figures in 1956 include nonrecurring income of $31,796.

Kerite

► For 1957: Net income of $1,123,770, which is equal to $4.38 per common share, compared with $1,173,222, or $4.58 a share, in 1956.

Garlock Packing

► For 1957: Net income of $1,643,980, which is equal to $3.33 per share, compared with $2,292,308, or $4.64 a share in 1956.

Approves Revision Of D15-57T

► American Standards Association, New York, N. Y., has announced that it has approved the latest revision of the American Society for Testing Materials Tentative Methods of Sample Preparation for Physical Testing of Rubber Products, D15-57T as American Standard J1. 1-1958. The formulae have been rearranged and brought up to date and mixing procedures have been modified in accordance with actual experience. The methods cover procedures for compounding and mixing of certain basic standard rubber compound formulations, utilizing standard ingredients together with recommended times and temperatures of cure. The methods may also be used to prepare mixes of the standard compounds in which one or more of the ingredients is nonstandard; or in which all ingredients are non-standard; or in which a standard material is substituted by a different material. Substitutions, however, may require changes in the standard mixing and curing procedures.

Origins of ASTM Standard D15 go back to 1915 and the present version is the fourth revision of an edition first published in 1950. In addition to natural rubber, it covers 13 standard ingredients. Copies of ASTM Standard No. D15-57T —AS No. J1. 1-1958—are available at 30c each from American Standards Association, 70 E. 45th St., New York 17, N. Y., or from the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna.

Dewey & Almy to Build New Plant

► Dewey and Almy Chemical Co., Cambridge, Mass., has announced plans to build a $4,000,000 organic chemicals and battery separator plant at Owensboro, Ky., to meet increased demand in both lines. This will more than double the company's capacity for vinyl acetate polymers and copolymers for paints, adhesives, paper coatings and textile sizing, as well as for styrene-butadiene copolymer latices for paints, paper coatings, rug backing, fabrics and foam rubber. It will also substantially increase capacity for battery separators, the company states. The Owensboro facility, to be constructed on a 143-acre tract bordering the Ohio River, will provide a source of supply close to major markets in the Midwest and South. It is expected to begin operations early in 1959. Existing production facilities for organic chemicals at Cambridge and Acton, Mass., and for battery separators at Acton, have also been enlarged.

West Named Sales Representative

► United Carbon Co., Inc., Charleston, West Va., has appointed Gene West southern district sales representative to serve under the direction of district sales manager, D. A. Reneau at the company's Memphis, Tenn., sales office. A graduate of the University of Louisville in business administration and marketing, Mr. West was transferred to his new position from the company's Production Division.

Sets Rubber Safety Record

► Firestone Tire & Rubber Co., Akron, Ohio, has set what is said to be a new world safety record for the tire industry. A recent telegram from National Safety Council president Ned H. Dearborn read: "Firestone has a new safety champion. The Pottstown, Penna., tire plant not only completed two solid years at midnight, January 24, without one lost-time injury, but in doing so has run up 9,017,740 hours of work without a single mishap that would have caused a man to be disabled or to lose time from his job. . . . " Firestone's safety program was reorganized by J. E. Trainer, executive vice-president of Firestone. In 1945, the first full year under the new program, Firestone won the highest honor given by the National Safety Council, its Award of Honor. Since 1945, Firestone has won the Award of Honor nine times on a company-wide basis and has reduced its accident frequency rate, the number of disabling work injuries for each million man-hours of work, from 11.1 in 1945 to 1.1 in 1957. The latest accident frequency rate available for the entire rubber industry is 3.3 for 1956.

Bigler Named Vice-President

► Larry Bigler has been appointed vice-president in charge of sales for Griffith Rubber Mills, Portland, Ore. The firm has also named Ted VanRyke and Morris R. Helser sales engineers in the Protective Coatings and Linings Division in Portland, which was recently enlarged to serve requirements of western industry. Mr. Bigler will be in charge of sales for the company's Portland facilities, its subsidiaries in Seattle, Wash., and its affiliate in British Columbia, Canada. He is a former sales manager of Griffith Rubber Mills, and assisted in developing the Griffith marine line of rubber accessories. Mr. VanRyke is a former resident of Tacoma, Wash., where he was employed for several years by a chemical construction company. He has had considerable experience in the protective coatings field and has received training at the B. F. Goodrich Rubber Linings and Coatings Department in Tuscaloosa, Ala. Mr. Helser will specialize in sales of mechanical rubber goods and extrusions in the Portland area. He has operated his own trucking business in Portland for the past 20 years.

C. P. Hall Names Davis and McMillen

McMillen

► S. A. Davis, formerly vice-president of the C. P. Hall Co. of Illinois, has been elected president. Mr. Davis joined C. P. Hall in 1932 and in 1939 he moved to Chicago and helped organize the Illinois concern. He is a director of the Chicago Drug and Chemical Association. C. K. McMillen has been elected vice-president of the firm, succeeding Mr. Davis. Mr. McMillen has been associated with C. P. Hall since 1946 and since 1953 has been assistant secretary and treasurer. He is a graduate of Ohio State University.

Davis

Amoco Chemical Names Rieger

► George Rieger, who was formerly market research manager for the Diamond Alkali Co., has been appointed market research and development director for Amoco Chemicals Corp., Chicago, Ill. Company officials stated that this newly created position reflects the increased activity of the company in diversifying its position in the chemical industry. Prior to Diamond Alkali, Mr. Rieger was associated with Hercules Powder Co. and the Ethyl Corp. where he held various positions in technical and market research. Mr. Rieger graduated from the University of Louisville with a chemical engineering degree and received a master's degree in chemical engineering from the University of Minnesota. He is a member of the Commercial Chemical Development Association, the Chemical Market Research Association and the American Chemical Society.

Goodrich Nylon Cord Truck Tire

► A truck tire for over-the-road service which is made with all-nylon cord has been introduced by the B. F. Goodrich Tire Co., Akron, Ohio. Named the "All-Nylon Heavy Duty Express," the tire has a range of from six to twelve plies depending on its size and a tread as thick as that of tires built for heavier service. The tread is said to meet the road across its entire width, the curves edging each rib giving extra traction and increased resistance to skids. The "Flex-Rite" nylon cord body withstands double the impact of ordinary cord materials and resists heat blowouts and flex-break, Goodrich said. Two chafing strips reinforce the lower sidewalls of the tire and there are no cross threads to cause crimping and chafing. Said to offer high quality at economy prices, the tire is made in tubeless and tube-type, and is available in 13 sizes, ranging from 6.70-15 to 10.00-22.

West Coast News

► The technical portion of the Los Angeles Rubber Group meeting, held on May 5 at the Biltmore Hotel in Los Angeles, Calif., featured a talk by Al Hoffman (Universal Oil Products) on "Control of Ozone Cracking in Rubber Goods." According to Mr. Hoffman, much of the cracking occurring in rubber goods is caused by reaction of ozone on stressed rubber vulcanizates. Protection against ozone attack may be provided by either physical barriers such as wax, or by competing chemical reactions.

Mr. Hoffman said that the search for chemical antiozonants is guided by antiozonant effectiveness; freedom from toxicity and skin irritating properties; availability in quantity; reasonable cost; nonstaining and non-discoloring properties; migrating (to the surface) characteristics; unreactivity with formula ingredients; good physical properties; effectiveness in all susceptible polymer. Materials most closely meeting these requirements are substituted para phenylene diamines, such as UOP 88 and 288.

In order to obtain maximum ozone protection, however, it must be recognized that these materials are reactive, basic compounds. For maximum protection, therefore, he concluded, thiazole type accelerators, furnace type blacks and generally, non-acidic ingredients should be used when phenylene diamine antiozonants are used in the formula. Effectiveness of antiozonants vary in different polymers. Exposure conditions that affect cracking in vulcanizates are ozone concentration, temperature, amount of stress and dynamic or static test conditions. In addition, rubber goods should be manufactured to minimize internal stresses or sharp edges where cracking will most likely initiate, Mr. Hoffman stated.

Tlargi's 1958 Summer Outing, a "Desert Caravan to Las Vegas," was held on June 6, 7 and 8, when the group convened for a journey to the Desert Inn and the New Frontier Hotel. Activities at the three day meeting included sports, a Saturday evening dinner and show, and finally, a brunch at the Ramona Room of the New Frontier Hotel. Committees for the outing included:

Housing and Reception, Carl Hoglund (chairman), Bob Scherner, Chuck Ashcroft, Walt Kearney, Don Duncan and John Schmidt; *Ticket Sales,* John McSparren (chairman) and Tommy Keenan; *Transportation,* M. A. MacDonald (chairman), Robert Galvin, Robert Mikuta and Albert Lane; *Hoover Dam Tour,* Jimmy Jones (chairman); *Golf Committee,* Don O'Connell (chairman) and Chuck Findlay; *Prizes Committee,* Bill Ireland (chairman) and Dick Wells; *Official Photographer,* L. E. Budnick; *Athletic Program,* John Arensmeyer (general chairman) and Russ Nagel.

The Tlargi Yearbook may be obtained by writing to C. M. Churchill, Naugatuck Chemical, 5901 Telegraph Road, Los Angeles 22, Calif., or to L. W. Chafee, Ohio Rubber Co., 6700 Cherry Ave., Long Beach, Calif.

► The Los Angeles plant of the B. F. Goodrich Co. commemorated its 30th anniversary on May 2, at which time 55 people who had attained 30 years of unbroken service were each presented with an engraved gold watch from the company to honor the occasion. The plant, which occupies 46 acres in East Los Angeles, has doubled in size since its opening in 1928 and now has the capacity to produce 10,000 tires a day. A battery of 26 electrically controlled vulcanizers installed this year has completed a modernization program of plant production facilities. The Los Angeles unit has produced a total of 35,000,000 tires for use on passenger cars, trucks, buses, aircraft, farm equipment and for off-road construction and road building in the 11 western states.

► W. M. (Mel) Anderson, president and chairman of the board of directors of the Gross Manufacturing Co., Monrovia, is a candidate for a seat on the board of education of the Temple City Unified School District.

Named St. Joseph Representative

► St. Joseph Lead Co., New York, N. Y., has announced the appointment of Harwick Standard Chemical Co., Akron, Ohio, as sales representative for St. Joe Lead-Free Zinc Oxides in the states of Georgia, North Carolina, South Carolina and eastern Tennessee. Albert Koper and Aaron Groce will make sales contacts in these areas from Harwick's branch offices in Albertville, Ala. and Greenville, S. C. Carload shipments will continue to be made directly from the St. Joseph plant in Josephtown, Penna. In order to serve less-than-carload customers, Harwick will maintain stocks of St. Joe Zinc oxides in Greenville, S. C.

Introduces Butazate 50-D

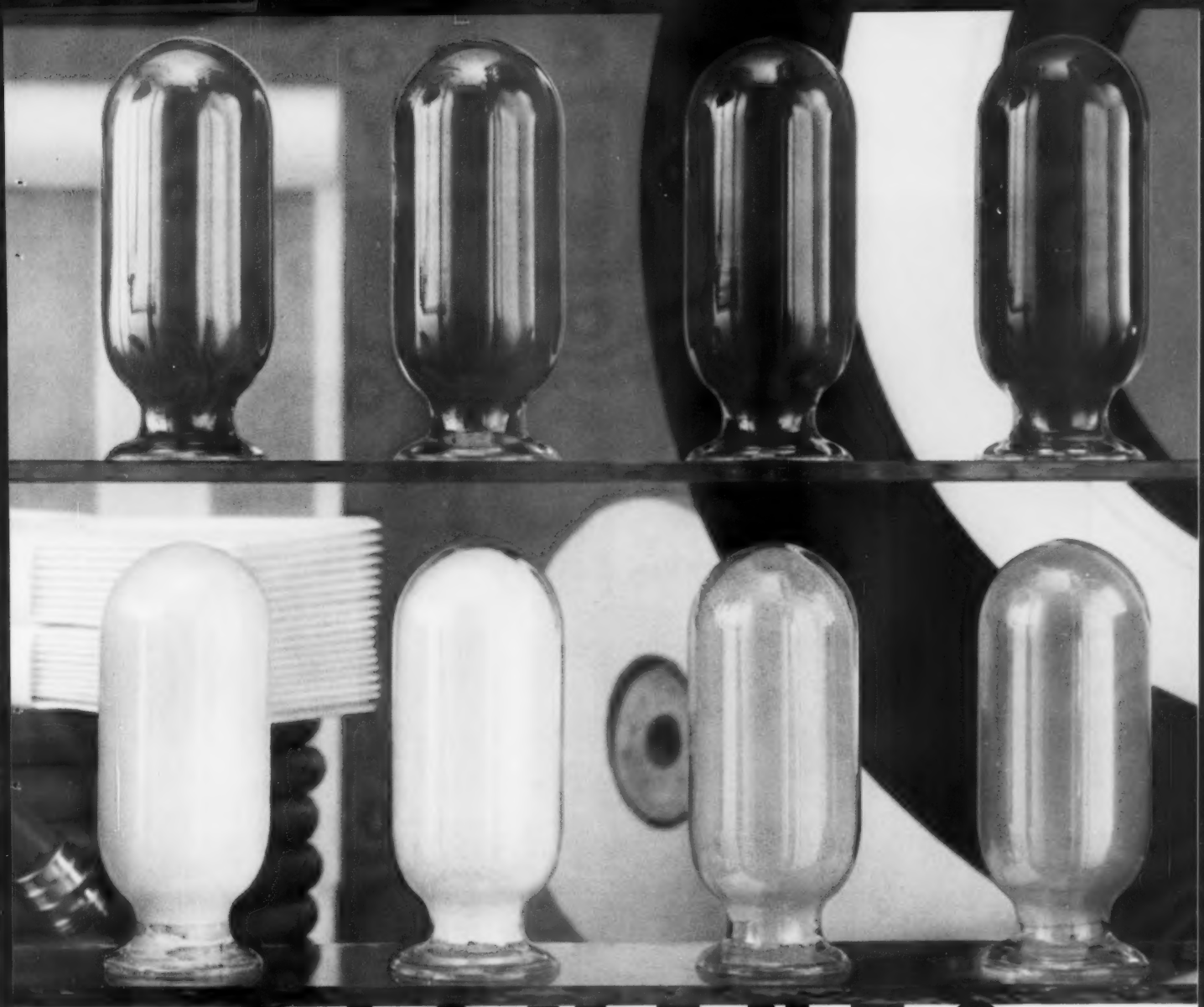
► "Butazate 50-D," a 50 per cent slurry for use in latex, has been developed by the Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn. The material, a water slurry of Butazate (zinc dibutyl dithio carbamate), contains 50 per cent by weight of active accelerator. It is intended for use in accelerating both natural and synthetic rubber latex compounds. According to the company, the slurry is stable, entirely compatible with such latices and may be added directly to them with simple stirring. Its use is said to eliminate the necessity for making up ball milled pastes from dry powders and thus to simplify compounding.

Low-Pressure Tires Tested

► Low-pressure pneumatic tires produced by the Goodyear Tire and Rubber Co., Akron, Ohio, are said to be making it possible for pilots of military observation aircraft to land and take off from seemingly unsuitable terrain. Shown here are the Goodyear "Airwheel", on the left, and the "Terra-Tire", on the right, which are being tested at Akron and Fort Rucker, Ala., by the Goodyear Aircraft Corp. and the Army Transportation Research and Engineering Command of Fort Eustis, Va. Army L-19 Bird Dog observers mounted with either Airwheels or 24-inch Terra-Tires are being flown in and out of plowed fields, clearings and other rough ground, ice and snow-covered areas, and marshy and sandy regions. The thin, extremely pliable walls of the tires, combined with their low pressure, enable them to absorb or conform with uneven surfaces without resistance and to glide over soft, giving surfaces without bogging down, the company states. Axle-driven Terra-Tires are also in use on trucks, trailers and other off-the-road vehicles.

Firestone Unit Decentralized

► Firestone Tire & Rubber Co., Akron, Ohio, has decentralized the Firestone Industrial Products Co. into two separate companies to more adequately cover the expanded activities and increasing diversification in products. The Firestone Rubber and Latex Products Co. at Fall River, Mass., has taken over the production, marketing and servicing of "Foamex" foam rubber. The new company will also produce and distribute numerous other rubber and plastic items. The unit at Noblesville, Ind., will continue to be known as the Firestone Industrial Products Co., and will produce, market and service a complete line of molded rubber products, including semi-pneumatic tires and air springs. Both companies will continue to be directed by P. P. Crisp, who joined the Firestone organization in 1929 and who, since 1942, has been president of the Industrial Products Division. R. D. Smith is president of the Firestone Industrial Products Co., while R. J. Mitchell is vice-president in charge of sales. C. J. McCready is president of Firestone Rubber and Latex Products Co., and W. W. Llewellyn is vice-president in charge of sales.



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Goodyear Appointments Announced

► The Research Division of the Goodyear Tire and Rubber Co., Akron, Ohio, has announced four appointments including R. C. Waller, as manager of plastics research; V. J. Anhorn, manager of organic chemicals processing; S. D. Gehman, manager of physics research, and F. J. Young as manager of process engineering. Associated with Goodyear since 1948, Mr. Waller has been engaged in polymer research work and was one of the men instrumental in developing Goodyear's recently announced polyester film, Videne. He is a graduate of Washington State College with a B. S. degree in chemical engineering and he obtained a Ph. D. degree in physical chemistry at Iowa State College. Mr. Anhorn joined Goodyear in 1954 with extensive experience as a research engineer. He received an A. B. degree in chemistry from Huron College and M. S. and Ph. D. degrees from Purdue University.

Mr. Gehman has been with Goodyear for almost 30 years, joining the company's Research Division in 1929. Recently, he has been head of the company's radiation research program which involves the use of cobalt 60 and a specially designed radiation laboratory. Mr. Gehman attended the University of Pennsylvania, where he received A. B., M. A. and Ph. D. degrees in physics. Mr. Young joined Goodyear in 1926 and has been associated with a number of activities, including work at Goodyear's aircraft subsidiary, which constructed the Navy airships Akron and Macon. He graduated from Ohio State University with a B. S. degree in mechanical engineering.

Cab-O-Sil Production Announced

► Chemicals Division of Cabot Carbon Co., a subsidiary of Godfrey L. Cabot, Inc., has announced that a newly completed plant at Tuscola, Ill., recently turned out the first American-made "Cab-O-Sil" silicon dioxide. With an annual capacity of 5 million pounds of silicon dioxide, the plant is Cabot's latest advance in supplying the demand for ultra-fine pigments. In 1950, Cabot completed a cross licensing arrangement with Degussa of Germany, in which Cabot obtained the rights to sell and produce the fine silica pigment which the Germans called "Aerosil." In 1952, Cabot introduced this product to the American market by importing it from Germany. In 1953, the trade name Cab-O-Sil was adopted and a full-scale market development was begun. Company officials stated that within two years the American demand for the product had increased to the point where production in this country became economical. In addition to Cab-O-Sil, an essentially pure carbon dioxide, the new plant eventually will manufacture other metallic oxides. Cab-O-Sil's present applications include reinforcing rubber polymers, stabilizing lubricating greases, coating reproduction paper, adjusting viscosity of paints and inks, and controlling properties of a wide variety of industrial powders and liquids.

New Polyethylene Antioxidants

► A number of new additive combinations which are effective in inhibiting the oxidation of polyethylene have been discovered at Bell Telephone Laboratories, New York, N. Y. These protectants are said to be up to ten times as effective as presently used antioxidants. Bell Telephone states that certain substituted thioethers, when used in conjunction with carbon black, have been found to gain exceptional antioxidant activity over their use in clear polyethylene. Conventional protectants tend to lose their effectiveness in the presence of carbon black. The substituted thioethers are formed by the condensation of conventional thermal antioxidants, such as aromatic amines or phenols, with sulfur dichloride. Alkyl, aryl and heterocyclic thiols and disulfides without amine or phenolic substituents are also effective antioxidants when used with polyethylene containing carbon black. About 0.1 per cent of the sulfur compound with 3 per cent carbon black is highly effective in reducing both thermal and photo-oxidation. The company states that with several of the new protectants, oxidation proceeds at a slow, even rate and does not become autocatalytic even after 2000 hours at 140°C. This is equivalent to much more than 20 years of normal life service.

Cyanamid Reduces DPG Price

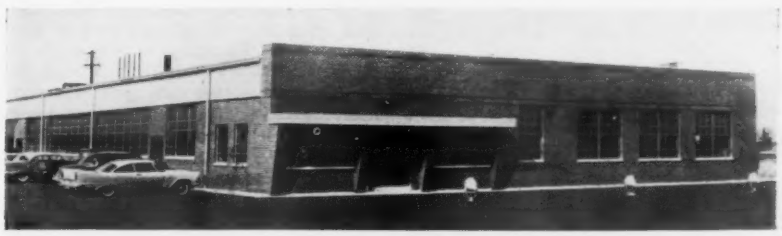
► The Rubber Chemicals Department of the American Cyanamid Co. has reduced the price of diphenylguanidine (DPG) regular or dustless by 5c per pound. Company officials said this was made possible by modernization of manufacturing facilities and processing techniques which have helped offset increasing freight and labor costs. Ton lots have been reduced from 54c to 49c, and standard package (less ton lots) from 55c to 50c. Prices are f.o.b. Cyanamid's Warners Plant in New Jersey. Prices west of the Rocky Mountains are 2c per pound higher.

Naugawhite Phenolic Antioxidant

► Naugatuck Chemical Division of the U. S. Rubber Co., Naugatuck, Conn., has introduced a new, low-cost, nondiscoloring, nonstaining phenolic type antioxidant to protect natural and synthetic rubber against light, heat and oxygen. Called "Naugawhite," the new material gives balanced all-round protection; functions in stocks of all colors and is particularly effective in white and light colored stock; forms a stable emulsion for use in latex and shows minimum color change in latex foam rubber and rug backing when exposed to nitrogen dioxide, according to the company. Naugatuck states that Naugawhite does not discolor rubber exposed to light, does not stain fabrics, lacquers and other materials by migration or contact, and does not yellow in a "Flue Gas (nitrogen dioxide) Test." Naugawhite, an alkylated phenol, is a clear amber liquid of moderate viscosity and a specific gravity of 0.96. "Compounding Research Report No. 41," available from the company, gives complete physical and chemical properties along with applications of the new development.

New O-Ring Production Process

► Minnesota Rubber Co., Minneapolis, Minn., has announced the development of a new process for producing O-rings which permits automation in O-ring production. Called "MinJecto," the process is a further refinement of injection molding, pioneered by Minnesota Rubber, with company engineers working to perfect the method over a three-year period. Tooling has been completed to produce O-rings in sizes from 1 through 27, which will be made of the standard Buna N compound 366Y, to produce what are said to be highest quality O-rings that are flash-free, high density and have exceptionally close tolerances. The new process permits Minnesota Rubber to make a large-scale downward revision of its O-ring prices in sizes 1 through 27, and to institute a policy of twenty-four hour delivery service.



Precision Rubber Opens New Plant

► Precision Rubber Products Corp. of Dayton, Ohio, has announced the opening of a new 20,000 square-foot plant at Lebanon, Tenn. All of the company's products, including O-rings, Dyna-seals and rubber-bonded-to-metal parts, will be manufactured in the new plant which has been equipped with the most modern machinery available. Precision Rubber states that the additional facility has been built in order to service the firm's rapidly expanding business. Robert C. Rickey, Jr., formerly superintendent of the Dayton plant, has been appointed general manager of the new facility, which will be called the Lebanon Manufacturing Corp.

Canadian News

► A new latex handling plant has been opened as the latest addition in the expansion program underway at Polymer Corp. Ltd., Sarnia, Ont. The $1.9 million steel, brick and transite plant had been under construction since 1957. Built to a height of three stories to take advantage of gravity flow, its design includes novel and unique features such as resin-lined tanks and glass piping throughout the latex handling system to reduce fouling and plugging of lines.

Individual latex systems eliminate the possibility of contamination, thus insuring a high standard of product cleanliness and uniformity. Up to date loading and weighing facilities handle shipments of all kinds from forty-five gallon drums to highway tank trucks and railway cars. A special railroad spur is laid into the building to permit tank car loading to be carried on indoors. The latest facilities in lunch and locker rooms are provided for the convenience and comfort of operating personnel.

In addition to the already existing types of latex, Polymer's new plant is producing a new product—"Polysar Latex 721"—primarily for manufacturing foam rubber. The marketing of Polysar Latex 721 marks the first production of this type of latex in Canada.

In other developments, Polymer Corp. has announced the appointment of J. R. Millar as assistant to the president and J. F. Sayre to succeed Mr. Millar as manager of the Purchasing and Stores Department. A graduate of the University of Toronto in chemical engineering, Mr. Millar has been associated with purchasing at Polymer since 1942, and has been manager of the Purchasing and Stores Department since 1946. Mr. Sayre, a chemical engineering graduate of McGill University, became assistant manager of the Purchasing and Stores Department in 1951, after serving with the Sales and the Economics and Yield Departments. Mr. Sayre has also been associated with Polymer since 1942.

► The annual convention of the Canadian Tire Dealers and Retreaders Association, held in Montreal, Que., on April 11, featured an address by Jackson L. Hayman of the Textile Fibers Department, E. I. du Pont de Nemours & Co. Mr. Hayman stated that rayon will ultimately be replaced by nylon as the major tire reinforcing material. Citing long-term testing in the company's Industrial Products Research Laboratory and with test and commercial fleets on highways throughout the United States, Mr. Hayman presented data showing nylon's superiority in 10 important tire characteristics—bruise resistance, high speed performance, flex fatigue resistance, heat resistance, moisture resistance, durability, safety features, long range economy, comfort in ride, and cooler operating temperatures.

Mr. Hayman said that tests were made of truck and taxicab fleets in which nylon cord proved significantly superior to rayon with respect to durability, retreading, and cost per mile. In original tread mileage, nylon cord truck tires were 16 per cent better than their rayon counterparts, he reported. In passenger tires on commercial taxicab fleets, no significant difference in original tread mileage was noted between tires of the two types.

► Bate Chemical Corp. Ltd. of Toronto, Ont., has been appointed distributor of "Pliolite" resins produced by the Chemical Division of the Goodyear Tire & Rubber Co. With sales and warehousing facilities in both Montreal, Que., and in Toronto, Bate Chemical will provide sales and technical service to paint and coating accounts for Pliolite S-3, S-5, S-7 and VT solution resins, and "Natural Rubber Pliolite." Pliolite S-3 is a high styrene-butadiene resin used extensively as a paint thickener and to impart anti-sagging properties for coatings applied to vertical surfaces. Pliolite S-5, an odorless, tasteless synthetic rubber resin, produces films of unusual clarity, strength and hardness.

Pliolite S-7, a thermoplastic resin, is specifically tailored for use as a coating for moisture-proof papers. Pliolite VT is a new mineral spirit soluble resin developed as a solution binder for coatings. Exceptionally strong and chemical resistant films can be made from this resin which has complete solubility in aliphatic solvents. Natural Rubber Pliolite is a cyclized derivative of high grade, low protein content rubber. This resin unmilled is used in hot melt coatings and paint, while the milled form is used as a paint vehicle, paper coating, and as a base for high speed printing inks.

► Goodyear Tire & Rubber Co. of Canada has announced plans to build a combined distribution center and divisional sales office in Ontario, estimated to cost $2.5 million. To occupy a 24-acre site at the former Long Branch racetrack in Metro, Toronto, the new unit will provide 375,000 square feet of floor space and will include an enclosed railway siding to accommodate 16 rail cars at one time and a 320-foot receiving dock for transport trucks. Construction is expected to start as soon as ground conditions permit.

► Day Co. of Canada, Ltd., a subsidiary of the Day Co., Minneapolis, Minn., is completing an addition to its Rexdale, Ont. plant, which will more than double the size of the present unit. The new facility will be equipped with the latest power machinery for custom fabricating sheet steel, alloys and light structural materials which the company will handle in addition to its regular line of dust control and bulk material handling equipment.

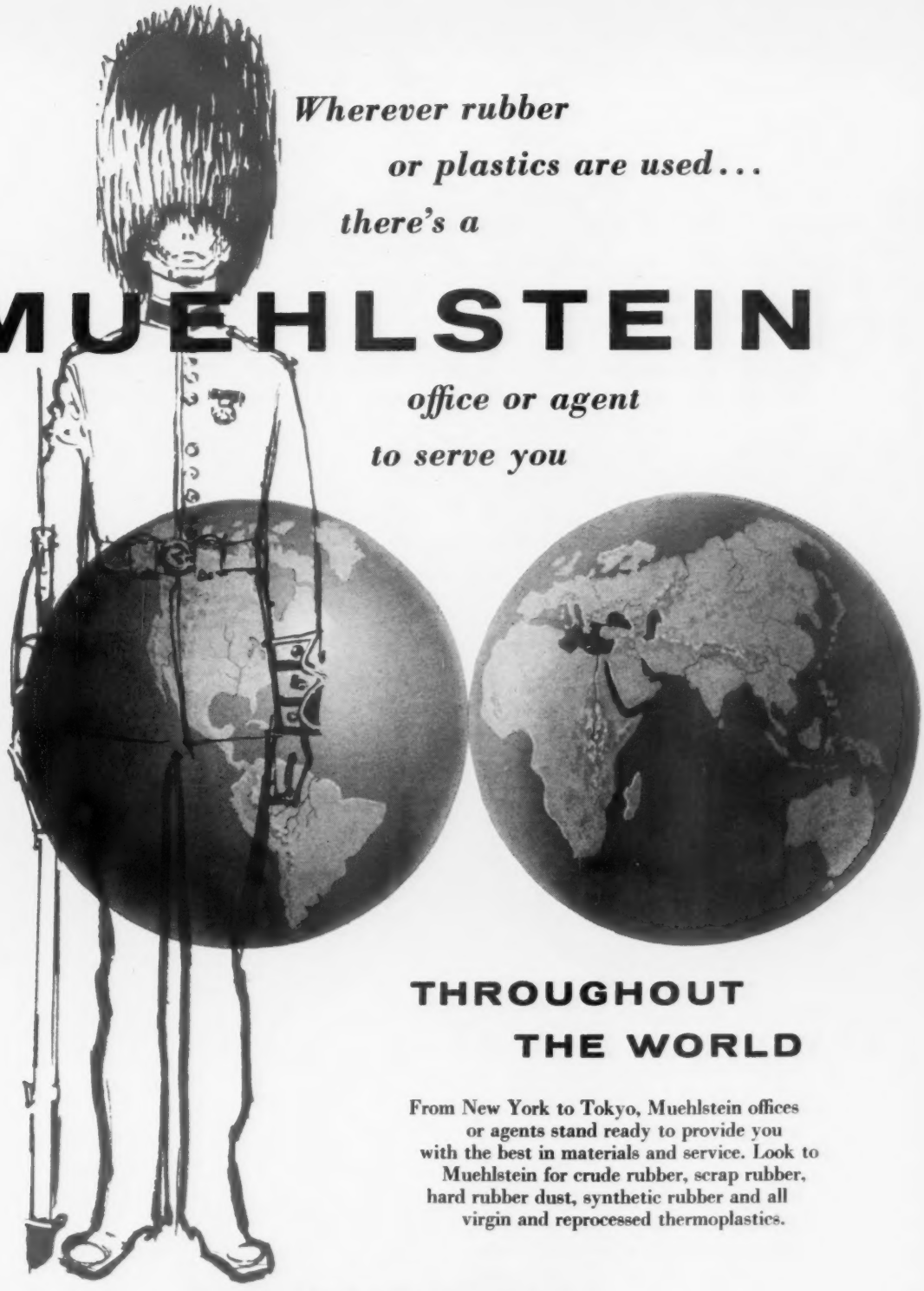
► Union Carbide Canada, Ltd., Toronto, Ont., having completed an expansion program at its Montreal East plant, has announced a further multi-million dollar expansion step designed to increase total capacity of that plant by an additional 30 per cent. This expansion is said to be geared to the increased consumption of polyethylene in Canada. Scheduled for completion by the spring of 1959, the Union Carbide plant will have an output of some 40 million pounds a year. Polyethylene consumption in Canada zoomed to 34 million pounds last year—up around 50 per cent from 1956. Industry officials are forecasting a new record consumption of around 50 million pounds in 1958, which would represent a 47 per cent jump over last year. Union Carbide's Montreal East plant went on stream in mid-1957 producing polyethylene resins and petrochemicals such as ethylene glycol, ethylene oxide, the ethanolamines and other oxide derivatives.

► Dunlop Canada, Ltd., has announced the appointment of G. F. Plummer as senior vice-president and Frank Usher as director and vice-president of finance. Mr. Plummer joined the company in 1940 as internal auditor. In 1953, he became a director and in 1955, he was appointed vice-president of automotive sales. As senior vice-president, he will be responsible for the Automobile Division and assist the president in more general company management. Mr. Usher, with 31 years of service with Dunlop companies, was appointed overseas accountant at the headquarters of the parent company, London, England, in 1944, and later was director of finance in New Zealand.

► Pigment & Chemical Co. Ltd. of Montreal, Que., has announced that Gordon H. Lawrence has joined the staff as a sales representative covering the province of Quebec and Eastern Ontario. Mr. Lawrence has been moved from Toronto where he served as representative for six years for the Latex and Reclaim Division of the Dominion Rubber Co. Ltd. Prior to that, he handled sales for that division in Quebec and Ontario from 1948 to 1952 after completing two years training in laboratory and plant. Mr. Lawrence will be servicing the rubber, paint and plastics industries.

► H. M. Sherwood and D. R. Fraser of the Textile Fibres Division of Canadian Industries, Ltd., will exchange their present positions as of July 1. Mr. Sherwood, now works manager of the "Terylene" plant at Millhaven, Ont., will move to Montreal to become the Division's sales manager, while Mr. Fraser will leave his sales post to take over management of the plant. C-I-L has also announced that R. B. Winsor, general manager of the Textile Fibres Division, was elected a director at the company's annual general meeting.

► Kenneth R. Stricker, formerly field sales manager for the Footwear Division of B. F. Goodrich Canada, Ltd., has been appointed sales manager for B. F. Goodrich Sponge Products Canada, Ltd., Waterville, Que. Mr. Stricker's new headquarters will be at Toronto.



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Obituaries

Wallace L. Cook

► Wallace L. Cook, chairman of the board of the Whitney Blake Co., New Haven, Conn., and the Reliable Electric Co., Franklin Park, Ill., died on April 26 in Chicago, Ill. He was 78 years old. Mr. Cook, who was born in Sioux City, Iowa, studied at the University of Iowa. He began as an engineer with the American Telephone and Telegraph Co. in Chicago in 1902. From 1903 to 1913 he was with the Western Electric Co. in equipment engineering and sales. In 1913, Mr. Cook bought an interest in Reliable Electric, a communication and power line equipment firm. He became president in 1918 and chairman in 1940. He bought a controlling interest and became chairman of Whitney Blake in 1938. In 1953, Mr. Cook established the Cook Foundation of Hamden, Conn., for the charitable needs and college scholarships for employes of his two concerns. A Shriner and Knight Templar, Mr. Cook was a member of the Lotos and Quinnipiac Clubs of New Haven, the Chicago Athletic Association, and the American Institute of Electrical Engineers. He is survived by a son and two grandchildren.

Osborn H. Cilley

► Osborn H. Cilley, a vice-president and director of U. S. Asbestos—Grey-Rock Division of Raybestos-Manhattan, Inc., died on April 15 at Lancaster, Penna., following a brief illness. He was 75 years old. Born in Lowell, Mass., he became associated with U. S. Asbestos at Manheim, Penna., in 1920 as plant superintendent. In 1928, he became assistant general manager of the division. In 1941, he was elected a director of Raybestos Manhattan, and in 1946, a vice-president of the corporation. From 1953 until 1958 he was general manager of U. S. Asbestos. A resident of Lancaster, Penna., Mr. Cilley was active in civic and church activities. He was a director and former president of the Mechanical Packing Association. Mr. Cilley is survived by his wife and a son.

Lester W. Riefenstahl

► Lester W. Riefenstahl, for the past twelve years associated with the R. M. Hollingshead Corp. of Camden, N. J., died suddenly on March 15 following a heart attack. He was 68 years old. A native of New York City, Mr. Riefenstahl had been associated with the Zapon Division of the Atlas Powder Co., the Federal Leather Co., Aldan Rubber Co., and Compania Hulera El Popo of Mexico City during his career in the rubber industry. He is survived by his wife, a son, L. A. Riefenstahl, general manager of the Hansen Rubber Co. of Philadelphia, Penna., and a daughter.

A. F. Schildhauer

► A. F. Schildhauer, retired laboratory director for E. I. du Pont de Nemours & Co., Inc., died on March 2. A graduate of the Case School of Applied Science, Mr. Schildhauer had extensive experience in the rubber industry and prior to his career with DuPont, he had been associated with Mechanical Rubber Co., Chicago, Ill.; the U. S. Rubber Co., and the Manhattan Rubber Co. at Passaic, N. J. In 1931, he joined DuPont as technical superintendent at the Fairfield Plant of the Fabrics & Finishes Department, and he was appointed laboratory director at that plant in 1945. He retired from the firm in December 1949, and afterwards, lectured at Clemson University in the School of Business Administration. Mr. Schildhauer was an active member of the American Chemical Society and served on several A. S. T. M. Committees. He is survived by his wife and one daughter.

Frank B. Ward

► Frank B. Ward, purchasing agent and assistant secretary for the American Biltrite Rubber Co., Chelsea, Mass., died at his home on May 19 after a short illness. Mr. Ward, one of the company's oldest employees in length of service, was born in Stoughton, Mass., and attended school there. In 1914, he joined American Biltrite at its Stoughton plant and worked continuously for the firm since that time. Mr. Ward moved to American Biltrite's main office in Chelsea in 1932. He is survived by his wife and son.

Charles R. Ross

► Charles R. Ross, field representative for the Industrial Products Division of the Goodyear Tire and Rubber Co., Akron, Ohio, was killed on April 6 in a commercial airline crash near Tri-City Airport in Michigan. He was 32 years old. Mr. Ross, who was born in Detroit, Mich., attended Wayne University and served three years in the army before he joined Goodyear in 1953. He is survived by his mother and a brother.

Austin L. Hawk

► Austin L. Hawk, a sales executive for the Manhattan Rubber Division of Raybestos-Manhattan, Inc., died of a heart attack at St. Vincent's Hospital in Cleveland, Ohio, on March 21. He was 47 years old. Mr. Hawk started in the Chicago office of Manhattan Rubber in 1929 as a clerk and progressed through several executive assignments to the position of manager, Central Sales Region, which he held at the time of his death.

Morris H. Laatsch, Jr.

► Morris H. Laatsch, Jr., manager of service compounding for the Goodyear Tire & Rubber Co., died unexpectedly of a heart attack on March 20 in Akron, Ohio. He was 41 years old. Mr. Laatsch joined the Goodyear organization in 1937 as a college trainee following his graduation from Alabama Polytechnic Institute. A year later he joined the company's compounding operations and was appointed technical superintendent at the Goodyear Fabric Corp., New Bedford, Mass., in 1947. In 1951, he was named chief chemist at the Gadsden, Ala., facility and became the technical superintendent there two years later. Mr. Laatsch returned to the Akron headquarters in 1956 as manager of service compounding. He served four years with the U. S. Army during World War II. Mr. Laatsch is survived by his wife, three sons and four daughters.

L. Harry Hoag

► L. Harry Hoag, formerly associated with the Spadone-Hoag Co., died on March 9 in a hospital at Hollywood, Fla. He was 70 years old. Well-known in the rubber industry, Mr. Hoag joined the Spadone Machine Co. of New York City in 1931. Some time later, the name of this company was changed to Spadone-Hoag. Mr. Hoag retired from this latter concern seven years ago. At that time he was engaged as a sales engineer in the metropolitan New York area. Prior to joining Spadone Machine, Mr. Hoag had served as advertising manager of the *India Rubber World*, now *Rubber World*. He is survived by his wife.

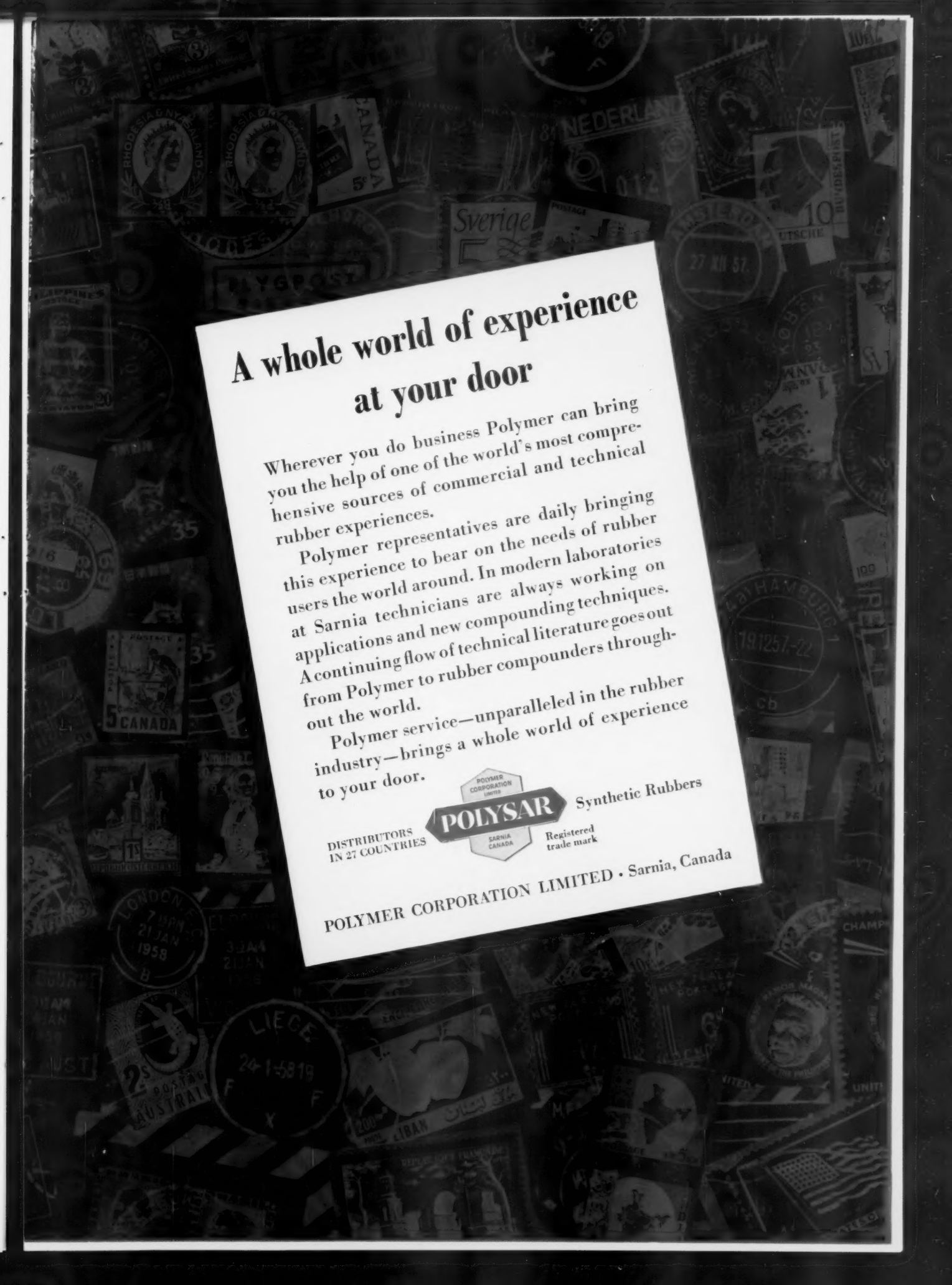
Edna L. Travers

► Edna L. Travers (Mrs. Wilson H. Brittingham), president of Bingham Brothers Co., New York, N. Y., died on April 14 of a heart attack. She was 61 years old. Mrs. Brittingham, who used her maiden name in her career, joined Bingham Brothers in 1915 as a private secretary to Fred Bingham, the president. Subsequently she became company secretary and in 1934, on the death of Mr. Bingham, president. Mrs. Brittingham is survived by her husband and a sister.

John W. Fisher

► John W. Fisher, assistant general purchasing agent for the Anaconda Wire and Cable Co. of Hastings-on-Hudson, N. Y., died in Yonkers General Hospital on March 24. He was 49 years old. Mr. Fisher was past president of the Yonkers Civic Association and was active in the Boy Scout movement in New Rochelle. He is survived by his wife, a son and two daughters.

► "Passenger Car Tires—Care and Service", a 24 page booklet, has been published by the Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y. Quantity requirements of this booklet should be requested from tire manufacturers or mass distributors.



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Overseas

Thailand—The Thai minister of Economic Affairs has announced that merchants are free to sell rubber to Russia if they choose. However, he warned, application to sell rubber to Mainland China or North Korea must be referred to the Foreign Ministry. Most of Thailand's rubber currently is exported to the United States.

Leverkusen—The Farbenfabriken Bayer chemical combine plans to increase production this year of its "Perbunan N", synthetic rubber from about 6,000 tons to between 12,000 and 15,000 tons annually, and its "Perbunan C" to between 12,000 and 15,000 tons a year. "Polykarbonat", a new type of plastic, especially suited to insulation, is also scheduled to go into production this year at an initial rate of 100 to 150 tons monthly.

Calcutta—The Rubber Board of India has estimated an over-all deficit of 14,000 tons of rubber within six months and has recommended that users be allowed to import that quantity. At this time, licenses for the import of natural rubber are being cut, in some cases as much as 60 per cent. It is understood that quantity licenses covering 7,000 tons or less will be issued to cover monthly requirements.

Rio de Janeiro—D. L. R. Plasticos do Brasil, S. A., plans expansion of its manufacturing operations, with $450,000 to be financed by the International Finance Corp. D. L. R., owned entirely by Brazilian interests, was organized in 1946 and is engaged in the manufacture of a wide variety of molded plastics.

Madrid—Dunlop Rubber Co. has announced that a project to establish a tire factory in Spain has been halted because it has not been possible to arrange the necessary finance required from Spanish sources.

Calcutta—The government of India has decided to fix a quota of 100 tons of sole crepe rubber for export during 1958, with licenses issued to actual producers of sole crepe rubber in accordance with recommendations of the Indian Rubber Board.

Tasmania—Western Junction Airport at Launceston, Tasmania, has adopted rubberized bitumen for sealing airstrips following the successful use of this material at Melbourne Airport, Sale, Essendon and elsewhere in Australia.

Kuala Lumpur—The Malayan Rubber Goods Manufacturers' Association is pressing the government to pass legislation to prevent foreign capital from dominating Malaya's economy. There had been applications for the establishment of motor tire and tube factories in Malaya.

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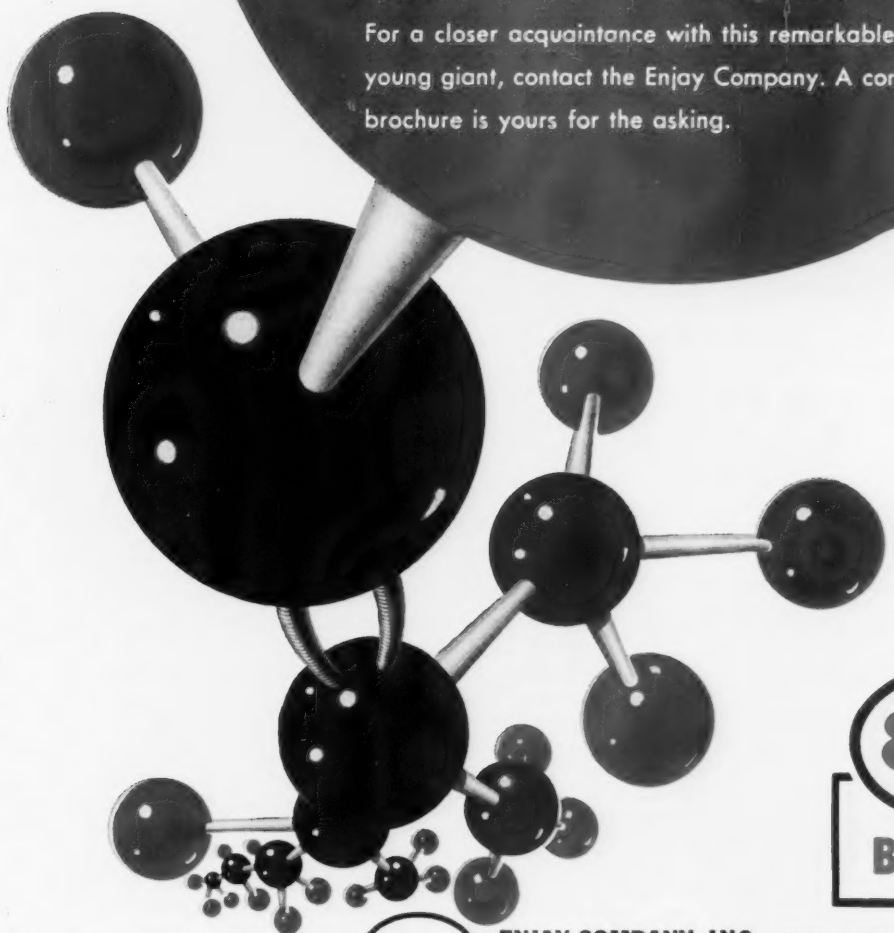

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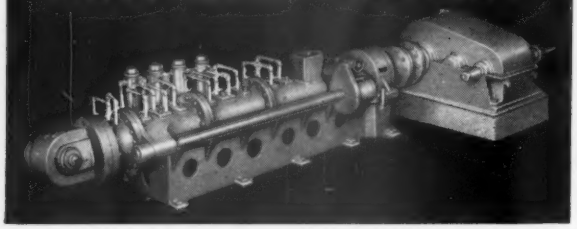

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New Goods

Vinyl Heel Protectors

► Designed to keep heel lifts from becoming worn, a new vinyl heel accessory produced by Liftsavers, Inc., New York, N. Y., may be slipped on to the heels of ladies' shoes without the use of nails or glue. Called "Liftsavers", the new accessories are kept secure by the

pressure applied to the heel during normal walking. Applied with slight fingertip pressure, Liftsavers prevent unsightly worn heels. The product is available in black for black shoes and clear for colored shoes. Milady can add a fashion note by wearing the clear Liftsavers on black shoes and the black on colored shoes as a contrasting trim.

Plioflex Rubber Hammers

► Rubber hammers that are useful in a wide range of applications in home and industry where mar-free pounding and tapping are required, are being manufactured by Valley Products, Inc. of Minneapolis, Minn. Made of "Plioflex", the hammers are available in 14 or 24 ounce sizes with either black or white heads set permanently on solid ash handles. In hammer head production, Plioflex and other compounding ingredients are processed on heated mills. Stock then is cut to exacting specifications and formed by compression molding. Valley Products reported that Plioflex requires several minutes less processing time per 150 pound batch than other polymers previously used. The white hammer is recommended for home use as it will not mark surface finishes on woodwork, floor molding, furniture or walls. In industry, rubber hammers are ideal for repairs and adjustments on assembly lines, in machine shops, and in shipping and receiving rooms. Automotive work also entails use of rubber hammers for body work, tire changing and tightening of fans and generators.

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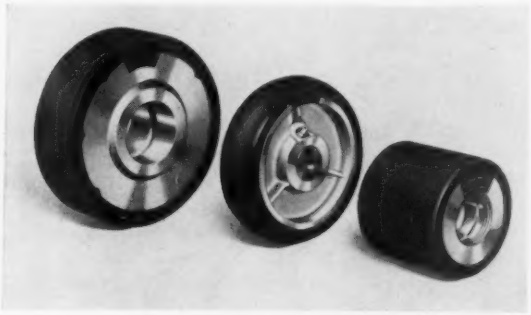
Durothane Industrial Tires

► Divine Brothers Co., Utica, N. Y., has introduced a new industrial tire which is made by casting polyurethane directly to the wheel rim. Designated "Durothane", the tire is manufactured in a full range of standard sizes and is said to combine the durability and strength of steel with the quiet, resilient features of rubber. It reduces the draw-bar pull of a fully loaded truck by as much as 30 per cent; is tough; abrasion resistant; does not flatten under load or chunk out under rough operating conditions, the company states. The tire is said to be equally effective when used as a nonmarking, floor protective wheel over finely finished floor



surfaces. A mechanical locking device to supplement the adhesive tire bond prevents separation of the tire from the rim when operated under severe overload.

Chemically inert and unaffected by oil, water, grease, brine and most industrial acids, the elastomer from which the tire is made is sparkproof and nonconductive; has a temperature range from —40 to +200°F.; a hardness of 90 durometer of A-2 Shore Scale; a tensile strength of from 4000 to 6000 psi; elongation of 600 per cent; tear resistance of 600 to 1000 pounds and a modulus of approximately 300 psi. Industrial truck wheels equipped with Durothane tires are now available for virtually all makes and models of hand lift or pallet trucks as original equipment, or as replacement of present wheels.

Goodyear Super Cushion Heel

► Goodyear Tire and Rubber Co., Akron, Ohio, has introduced a new type rubber heel said to give the wearer a soft step at the point of heel impact. Called the "Super Cushion" heel, it includes an insert of spongy but tough rubber called "Elasto Crepe," which covers an arc of 180° to provide cushioning and improved wearability. The insert is set deeply into the heel for better shock absorption; but the gap between the insert and heel is narrow to provide good appearance. As the insert eliminates the necessity for rights and lefts, the new heels need not be stored in pairs by shoe repairmen. A new design technique developed by Goodyear engineers resulted in an entirely new system of heel design engineering which is less costly, faster and produces a heel with a built-in shock absorber, which functions much like automobile shocks, the company states.

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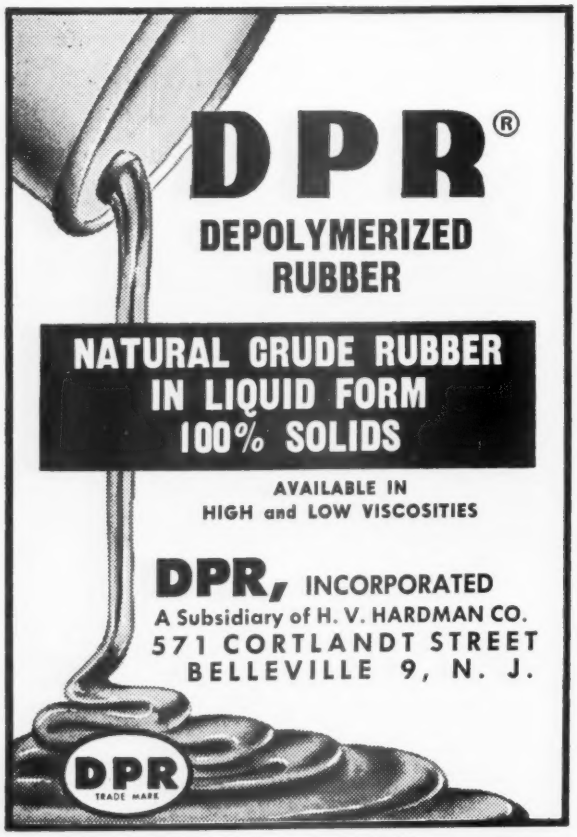

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1072 Butene Sealing Tape

► A sealing tape for glass-to-metal, glass-to-glass and metal-to-metal bonds, has been developed by Pittsburgh Plate Glass Co. Research Laboratories, Pittsburgh, Penna., to meet the specified needs of architects for modern curtain-wall building construction. Known as "No. 1072 Butene Sealing Tape", the black rubbery tape is easily applied from a roll just as it comes from the package. This vulcanized, tight sticking material is said to maintain its elastic and resilient nature while providing long life, weather tight seals of extreme durability. Extensive field testing of the product over a ten year period, with exposures to simulated hurricane proportions, show it to be highly resistant to severe conditions which in the past have caused rapid deterioration of sealing compounds.

The new sealing tape has shown good performance records under continuous exposure to temperature extremes ranging from —45° to 250°F. It also shows resistance to ultraviolet exposures. In addition to its building applications No. 1072 Butene is believed to offer special advantages as a sealer for the aircraft, appliance, automotive and marine industries as well as many specialized applications such as sealing swimming pools. Other special advantages are that its use eliminates masking and other pre-preparation steps as well as time-consuming cleanup operations on the job. Packaging is in roll form with release-free liner paper providing excellent stability for handling and storing.

Spearfisherman Deluxe Snorkel

► Developed by Swimaster, 905 E. 59th St., Los Angeles, Calif., the "Spearfisherman Deluxe Snorkel" was designed to meet the exacting demands of skin diving experts. Molded of semi-rigid amber rubber, this new snorkel has a specially curved tube that fits the face

and head comfortably. Available in either jet black or amber, the snorkel is entirely flexible, yet non-vibrating, and floats. A unique bite-shut mouthpiece that is made of soft, surgical-grade pure gum rubber is said to afford easy breathing. The mouthpiece is permanently fused to the tube offering exceptional mouth and lip comfort, according to the manufacturer.

Swimaster Flipper Slippers

► To be used as a cushioning inner-shoe with any style or type of swim fins, "Flipper Slippers," manufactured by Swimaster of Los Angeles, Calif., are the result of a specially developed foam vinyl material that combines comfort with durability. Flipper Slippers are said to prevent blisters, soreness, abrasions and foot cramps caused by extensive use of swim fins. The internal cushion comfort enables the diver to attain maximum power endurance, while the high-cut design and tough outer skin provide complete foot and ankle protection against cuts from rocks and coral. The same Flipper Slipper protection eliminates the inconvenience of wearing fins when entering or leaving the water over rocky shoreline. Before or after diving, Flipper Slippers provide protection against rocks, splintered piers or hot surfaces such as sand and concrete. Packed in Swimmaster's "Visu-pacs," Flipper Slippers are available in six sizes and represent the company's newest contribution to personal enjoyment in skin diving.

Trend Vinyl Upholstery

► U. S. Rubber Co., New York, N. Y. has announced the development of a new type upholstery material for home furniture which combines the lasting qualities of vinyl with the versatility of soft woven fabric. Called "Trend", the vinyl reinforced fabric is being introduced in U. S. Rubber's "Breathable Naugahyde" line. Utilizing a new manufacturing process, a soft woven fabric is fused to a special protective vinyl coating that gives color fastness and resistance to soiling. Silvery metallic flitters accent the vinyl design. The new construction produces upholstery that is breathable, supple, easy to tailor, long wearing, and wipes clean with a damp cloth. Trend is being introduced by U. S. Rubber in ten colors —canary, meadow green, antique white, claret, mocha, cerulean, rock rose, glen green, black and deep toast. It is being made at the U. S. Rubber Stoughton, Wisc. plant in 30 yard rolls, 54 inches wide.

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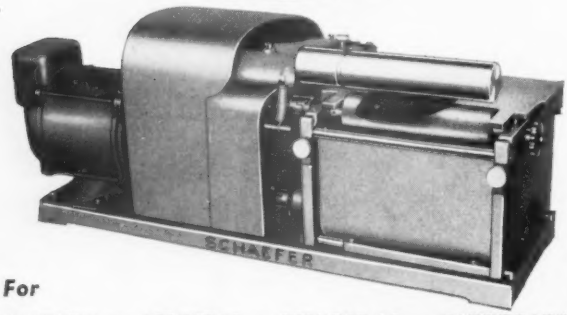

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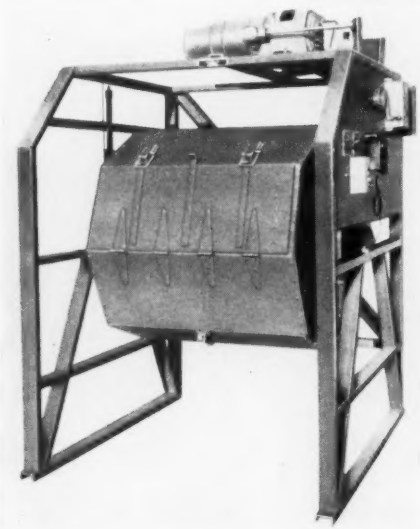
New Equipment

Insulated Tumbling Barrel

► A new low temperature insulated tumbling barrel which uses liquid CO_2 instead of dry ice is said to cut deflashing time 30 to 50 per cent for soft molded rubber parts. Manufactured by Tumb-L-Matic, Inc., St. Mary's



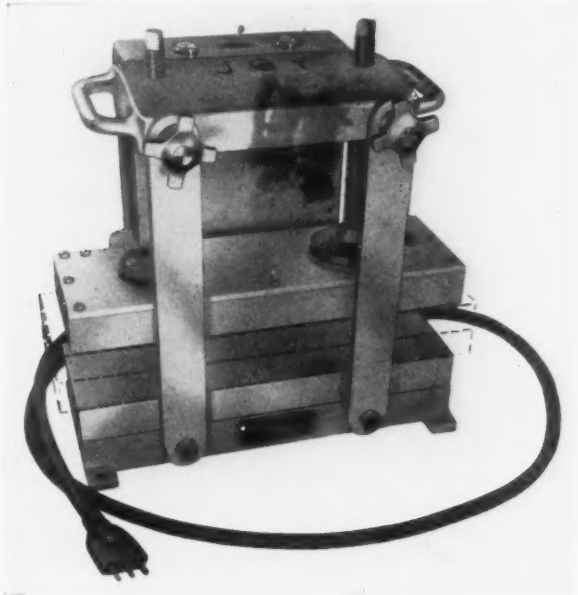
Street, Stamford, Conn., the new unit develops temperatures ranging from 0° to —120° through direct expansion of liquid CO_2 in the barrel. According to company officials, adjustments are made so fast tumbling can be started immediately. Completely self contained, the unit eliminates storage and handling problems encountered in dry ice systems. The system is furnished complete for automatic temperature regulation, and to operate need only be hooked up to an electrical current and gas supply.

PYRO Surface Pyrometer

► The Model DR-35 PYRO surface pyrometer, a product of Pyrometer Instrument Co., Bergenfield, N. J., is said to be the first accurate and versatile double range instrument designed for plant and laboratory surface and sub-surface temperature measurement. The 4¾-inch indicator has two scale ranges in different colors, the low range being from 0 to 500°F. and the high range from 0 to 1500°F. A range selector switch permits change from one to the other by a flick of the finger. The meter is said to correct itself automatically for changes in room temperature, and to assure an accuracy within 1½%. It is available with a selection of 15 different types of interchangeable thermocouples as well as flexible and rigid extension arms. The meter comes in a dust, moisture and shock resistant shielded steel housing. The two temperature ranges are said to provide high accuracy and readability for low temperature measurements, and also use for high temperature problems.

Joy Vulcanizing Press for Electric Cable

► Joy Manufacturing Co., 1201 Macklind Avenue, St. Louis 10, Mo. has announced completion of an entirely new line of molding presses for reinsulation and rejacketing natural rubber, synthetic rubber and thermoplastic covered cables. Reputed to accommodate all standard cables types and sizes through the use of interchangeable aluminum molds, the presses carry a 3000 watt rating and are currently available for operation on seven standard



ac and dc voltages. Heat from four replaceable strip heaters is applied directly through molds to areas being vulcanized at molding pressures of up to 25 tons. Twin tie bars can be dropped for front loading and permit using the press to create Y and T splices. The vulcanizers, 18⅛ inches long by 18¾ inches high and 13 inches deep, accommodate rectangular shaped molds up to 6 x 6 x 24 inches. They can also be used in tandem for making longer cable repairs.

Falls Engineering Urethane Stock Cutter

► A machine which will cut cubes of urethane stock into various sizes up to 24 x 24-inches and in thicknesses of from 1 to 3 inches is built and marketed by Falls Engineering Co., Cuyahoga Falls, Ohio. Known as the Rudmar Cutter, the machine has turned out two-inch cubes at the rate of 16,000 an hour, and will cut sponges and other larger cubes from slabs of stock which are held in place between two grooved platens, the manufacturer reports. The grooves in the platens allow a series of knives, cutting in a criss-cross pattern, to slice the material into cubes. After the cutting operation the cube pieces drop into a tote box. A larger model which will handle urethane stock in sizes to 36 x 36-inches is in the planning stage.

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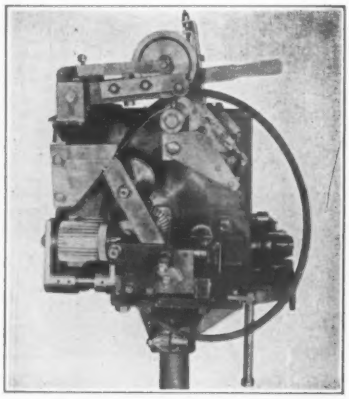

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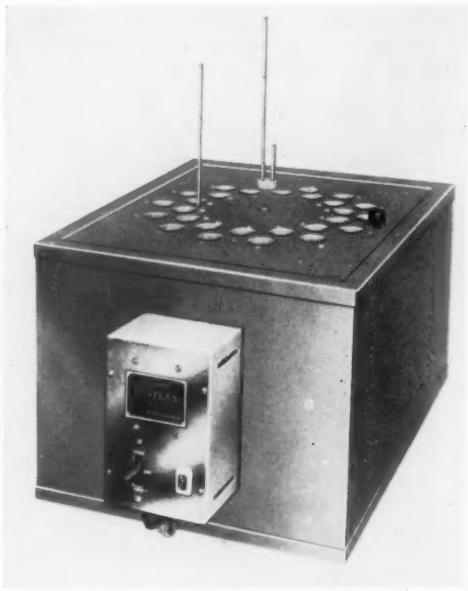
New Model Scott Aluminum Block Aging Tester

► Scott Testers, Inc., Providence, R. I., has announced a square design for its 28-hole Aluminum Aging Block Model LG, which has become a standard apparatus



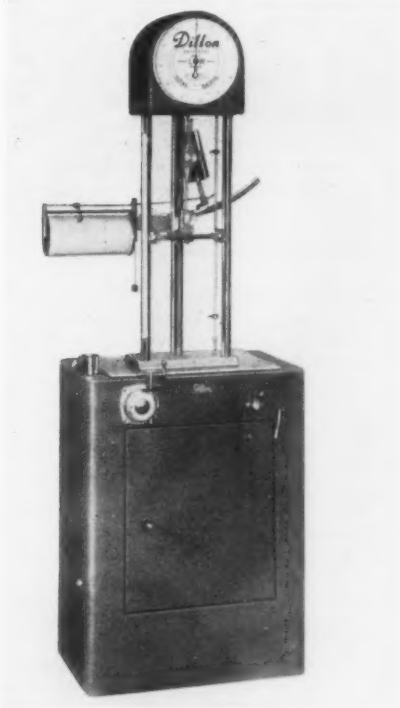
in the elastomeric industry for testing in accordance with ASTM Method D-865-54T and D-471-55T at temperatures up to 600°F. The new shape is designed to fit into a corner or row of companion equipment. On special order, the LG, either square or round, is available for temperatures up to 750°F. Special models, LGH and LGP, for temperatures up to 1000°F. or for pressure air or oxygen aging are also available.

Fife Cambering Rollers

► Fife Manufacturing Co., P. O. Box 878, Oklahoma City, Okla., has announced that through a "pinch roller" application of the Fife Cambering Rollers, a web moving in a straight path can be guided with extreme accuracy without flexing the web or in any way disturbing its longitudinal register. The roller assembly can be installed in a horizontal path or in any other plane where automatic guiding might be required, according to the manufacturer. Formerly use of guide rollers at intermediate points between the unwind and rewind rolls of a continuous operation required that the web be wrapped around the guide rollers in some manner to achieve purchase, or friction, between the guide rollers and the web. This was not always possible in the processing of stiff or more rigid materials, nor could some extremely accurate operations tolerate the additional travel around the guide rolls. The new assembly is said to eliminate these difficulties, and also in many cases be less expensive than conventional equipment.

Dillon Multi-Low Range Tester

► Development of a new 300-pound capacity universal tester has been announced by W. C. Dillon Co., Inc., 14620 Keswick Street, Van Nuys, Calif. A small laboratory instrument, said to be accurate to within one-half of



1% of indicated readings, the machine is designed to make tests in tensile, compression, transverse or shear quickly and economically. It can handle plastics, film, resins, adhesives and other low-strength materials. The instrument operates on the principle of a calibrated pendulum, one of the most accurate of all load measuring devices. It features an improved automatic stress-strain recorder which draws a curve on a graph sheet, a built-in limit switch to prevent overrun, and it also indicates maximum applied load. The tester has a grip clearance of 14¾ inches. Models with openings of up to 36 inches are available for testing of highly elastic materials.

► A new **portable lightweight industrial radiography unit** which is said to provide sharp radiographic detail and exceptional penetrating power has been announced by the Instruments Division, Philips Electronics, Inc., Mount Vernon, N. Y. It is powerful enough for use with opaque materials such as rubber and plastics.

► Two new **panel meters** designed to save panel space have been announced by Simpson Electric Co., 5200 W. Kinzie St., Chicago, Ill. They are said to be accurate to ±2% full scale range deflection in DC ranges.

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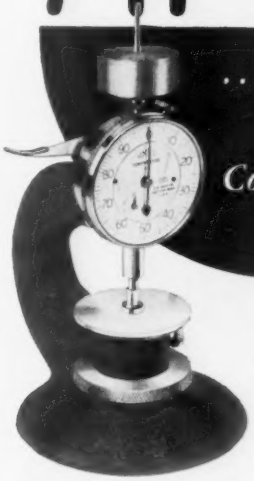

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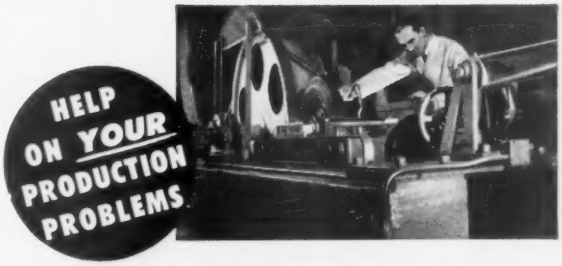

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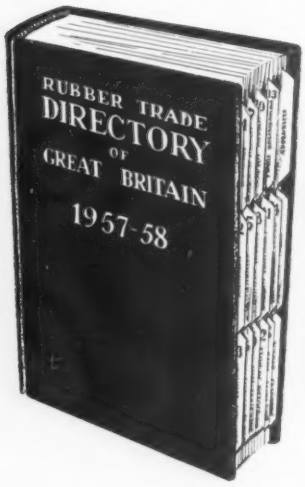

RUBBER TRADE DIRECTORY OF GREAT BRITAIN 1957-58

THIRD EDITION

A Comprehensive, Fully Classified Guide to all Sections of the Industry and to Suppliers of all Raw Materials (including Chemicals and Textiles), Laboratory and Other Equipment, Machinery, and Ancillary Products used by Manufacturers of Rubber Goods

CONTENTS

1. Rubber Manufacturers and Suppliers
2. Rubber Machinery and Equipment
3. Instruments and Laboratory Equipment
4. Chemicals and Compounding Ingredients
5. Fabrics and Textiles
6. Components
7. Natural Rubbers and Latices
8. Synthetic Rubbers, Latices and Kindred Materials
9. Reclaimed Rubbers
10. Scrap and Waste Rubber Merchants
11. Manufacturers' Sundry Requirements
12. Trade Marks and Brand Names
13. Trade and Research Organizations
14. Rubber Technology Schools and Courses
15. Who's Who in the British Rubber Industry

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Reviews

BOOKS

Rubber Reviews for 1957. Published by the Division of Rubber Chemistry, American Chemical Society. Available from the Treasurer: Mr. George E. Popp, Phillips Chemical Co., 318 Water St., Akron 8, Ohio. 6 x 9 in. 360 pp. $5.00.

Ever since "The Chemistry and Technology of Rubber," edited by Davis and Blake, long regarded as the "bible" of the rubber technologist, has been out of print, there has been a growing need for a replacement text of some kind. This is particularly true in view of the rapid developments which are taking place in rubber technology. In recognition of this need, the ACS Division of Rubber Chemistry in 1956 appointed a New Publications Committee, headed by Norman Bekkedahl of the National Bureau of Standards, to survey the currently available books dealing with the science of rubber and to make specific recommendations.

After a survey of the field, the New Publications Committee came up with the conclusion that the preparation of a comprehensive book on the science and technology of rubber would be a tremendous task and would take years to compile and publish. It suggested, therefore, that a series of monographs be prepared and that these monographs might be incorporated into a fifth issue of *Rubber Chemistry and Technology*. In this manner, a new "bible" for the industry could be compiled on a kind of installment basis. As a result a special Editorial Board was appointed, also headed by Mr. Bekkedahl, and *Rubber Reviews* was born. Actually, it is the fifth issue in 1957 of *Rubber Chemistry and Technology*, but it bears a red cover for quick and easy identification. The same identification will be followed on subsequent editions.

This initial effort contains six monographs, ranging from 40 to 80 pages in length. The monographs and their authors include: (1) Dynamic Properties of Elastomers, by S. D. Gehman (Goodyear); (2) Aging and Oxidation of Elastomers, by J. Reid Shelton (Case Institute); (3) Vulcanization of Rubber with Sulfur, by David Craig (Goodrich); (4) Carboxylic Elastomers, by H. P. Brown (Goodrich); (5) Elastomers from Basic Monomers, by J. R. Haws (Phillips Petroleum); (6) Chemistry of Carbon Black and Reinforcement, by Merton L. Studebaker (Phillips Chemical). In each instance the subject matter is handled by recognized experts and each represents a comprehensive treatise. There is no doubt that an excellent start has been made to fill existing gaps in the technical literature.

The introduction to the current issue of *Rubber Reviews* has been prepared by Dr. G. Stafford Whitby. In addition there is a two and one-half page tribute to C. C. Davis by John T. Blake. Among other achievements, including selection as the Charles Goodyear Medalist for 1950, "C. C.," as he was affectionately known, was editor of *Rubber Chemistry and Technology* from its inception in 1928 until his death about a year ago. Also, this issue carries a decennial index covering the period from 1948 to 1957 (Volumes 21 through 30). A brief preface by the Editorial Board is also included.

Rubber Reviews is an ambitious undertaking. Because so many people had a hand in its planning and ultimate publication it is difficult to give specific credit. However, the New Publications Committee is to be congratulated on its ideas and recommendations and the Editorial Board is to be commended for its selection of subjects and authors. If one individual had to be selected for special honors in this instance it would be Dr. David Craig who not only contributed a monograph of his own, but who worked closely with the authors of the other monographs in this initial endeavor.

With the publication of *Rubber Reviews for 1957* the Division of Rubber Chemistry has established another landmark in the field of rubber chemistry and technology.

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REVIEWS (CONT'D)

Malaya. By Norton Ginsburg and Chester F. Roberts, Jr. Published by University of Washington Press, Seattle 5, Wash. 5¾ x 8¾ in. 534 pp. $6.00.

The result of a research project on Malayan society undertaken at the University of Chicago, this book analyzes the newly independent state of Malaya as it evolves from colonial status. The authors emphasize the pluralistic character of Malayan society and provide ethnographic analyses of the Malaysian, Chinese and Indian communities. The historical, environmental, social, economic and political settings within which the future of the new state is being determined are described and appraised.

As would be expected, the references to rubber are numerous. Rubber alone accounts for up to 60 per cent of domestic exports by value, and during periods of high prices for the product, nearly 30 per cent of Malaya's gross national income. And the indirect contributions of the industry to the country are tremendous. As the backbone of the national economy, rubber in all its economic and social aspects—from estate patterns to measures taken to compete with the synthetic market—is considered. The book is an American Ethnological Society publication.

•

Better Report Writing. By Willis H. Waldo. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22, N. Y. 5 x 7½ in. 230 pp. $4.75.

This small volume should find a ready place in the library of any writer who deals with scientific subjects. Purposely written as a quick reference instead of a classical exposition of technical English, the book presents authoritative facts on the important details of effective scientific composition, style, division of reports, tables, illustrations and use of words. Three appendices condense a vast amount of information on abbreviations, symbols and hyphenation. The author has been concerned with the problems of technical writing for many years, and at present is a technical editor for the Monsanto Chemical Co.

Directory of British Rubber Manufacturers and Products: 1958 Edition. Published by the Federation of British Rubber and Allied Manufacturers, 43 Bedford Square, London, W.C.1, England. 11¼ x 8¾ in. 204 pp. $5.00.

The latest edition of this buyer's guide to the British rubber industry has been completely revised and brought up-to-date. As usual, it is presented in four languages: English, French, German and Spanish. It is divided into four sections: (1) Rubber Manufacturers; (2) Rubber Products; (3) Advertisements; (4) Tire Manufacturers. The latter section also contains some advertising specifically related to tires. In the section on Rubber Manufacturers, the home office, address, telephone number, telegraphic address and locations of factories are given for each company. In most of these listings the company's overseas distributors are shown alphabetically by country. The Products section indicates sources of supply for more than 600 rubber and plastics items. This buyer's guide is primarily designed for overseas distribution. The Federation includes 23 member associations.

•

Control of Non-Manufacturing Costs. (Special Report No. 26). American Management Association, 1515 Broadway, New York 36, N. Y. 6 x 9 in. 142 pp. $2.00 (members) $3.00 (non-members).

Many companies today are registering higher volumes of sales only to find that net profits are lower. The reason, of course, is increased operating costs. The ten papers in this publication outline the policies developed by leading companies to combat this trend. Including three company studies on reduction and control of office expenses, this book provided valuable reading at a time when hidden costs are rising in general, with a corresponding decrease in profit margins. The authors were recruited from the ranks of well known industrial organizations. Together they present though provoking ideas on paring non-manufacturing costs.

Hydraulic Fundamentals and Industrial Hydraulic Oils. (Technical Bulletin B-4, Revised). Sun Oil Co., Philadelphia 3, Penna. 8½ x 11 in. 44 pp.

This publication offers a practical introduction to the principles of hydraulic systems, with illustrated explanations of the most important types of valves, pumps, motors, torque converters and accessories. Each component of the hydraulic system is described and illustrated with schematic drawings, and a schematic is also provided for the complete hydraulic system. Other sections of the booklet discuss hydraulic couplings and torque converters, available types of hydraulic oils, correct use of hydraulic oils, and trouble shooting. In the last section a chart depicts causes and remedies for common defects in pump operation. The text is clear and comprehensive, and effectively supplemented by the illustrations.

•

Butazate 50-D. By D. G. Gillette. (Bulletin No. 223). Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 4 pp.

Butazate 50-D is a water slurry of Butazate (zinc dibutyl dithiocarbamate), containing 50 per cent by weight of active accelerator, intended for use in latex. In addition to listing typical physical properties of the material, this bulletin contains suggested formulas for dipped goods (for use in both uncured and precured latices), fabric coatings and rug backings. Typical cures are shown. Although Butazate may be used alone, it finds more general applications in combination with O-X-A-F (zinc mercaptobenzothiazole). Directions for making a ball mill dispersion of the latter material, as well as a listing of its physical properties, are included in the bulletin.

Compounding Study: Fillers in Chemigum N6B. Chemical Division, Goodyear Tire & Rubber Co., Akron 16, Ohio. 8½ x 11 in. 16 pp.

The study presented in this report was made to provide a quick preliminary reference for selecting a filler for a nitrile polymer application. Only one polymer and cure system were used in order to show basic differences in fillers in a standard situation. The effect of each pigment on each physical property over the loading range normally used for that pigment is reported. The pigments selected were used to cover the entire range of particle size and degree of structure of the carbon blacks as far as practical, and from ultra fine to coarse in the case of the non-blacks. Graphs and tables are used to present the extensive testing and recipe data.

•

Passenger Car Tires—Care and Service. Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y. 8½ x 11 in. 24 pp.

This attractive brochure has been published to aid in the more efficient operation of the passenger car with added safety by offering detailed information on the correct use of the motor tire. Text, photographs and diagrams are used to present information on such topics as demounting and mounting, avoiding fabric injuries, preventing inflation failures, effects of speed, abnormal tread wear, common tire injuries, test for leaks, preventing tube failures and tubeless tire repairs. Three load and inflation tables correlate data on tire size, inflation pressures and maximum loads. A great deal of practical, valuable information is presented concisely and attractively, and unquestionably most motorists can benefit from the numerous hints on tire use and safety.

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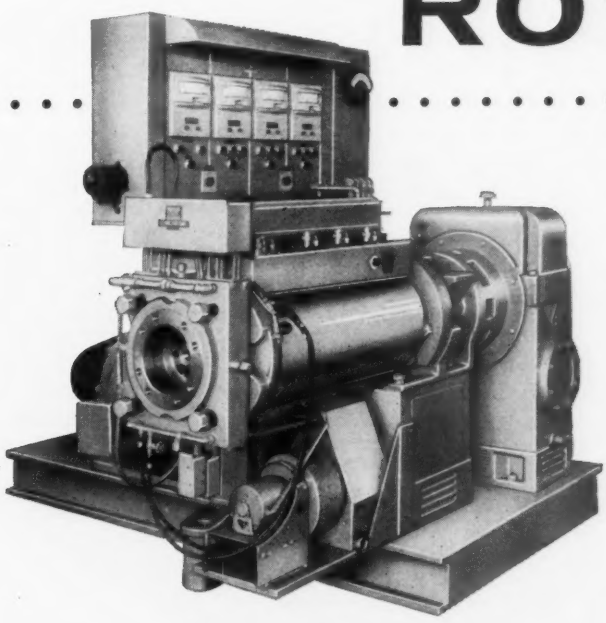

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CONDUCTIVE RUBBER:

ITS PRODUCTION, APPLICATION AND TEST METHODS

By R. H. Norman

The first of four technical manuals produced by staff members of the Research Association of British Rubber Manufacturers, this publication surveys a whole mass of results and presents the main conclusions in a form which can be easily used by the industry.

"Conductive Rubber: Its Production, Application and Test Methods," deals comprehensively with the conductive and antistatic classes of rubber. Chapter headings include — Contact Resistance — Manufacture — Effects of Stress, Time and Other Variables on Resistivity — Test Methods — Variability of Resistivity — Uses of Conductive Rubber.

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Barksdale Valves. (Catalog No. 58-59). Barksdale Valves, 5125 Alcoa Ave., Los Angeles 58, Calif. 8½ x 11 in. 56 pp.

Data to aid in the selection and application of valves are given in this booklet. The Barksdale line, which features a patented Shear-Seal leak-proof principle, is described in detail, and cross-section diagrams and photographs are used to illustrate the various types of valves. Simple graphs used to determine pressure drops and discharge and velocity of liquids, and a pressure conversion chart scaled from 0 to 3000 psi, are included at the end, along with an additional section which summarizes the probable causes and remedies for the more difficult maintenance problems. Maintenance suggestions are also given.

•

The Public Looks at Tire Cord. Chemstrand Corp., 350 Fifth Ave., New York 1, N. Y. 6 x 8 in. 14 pp.

The data derived from a research study by Blankenship, Gruneau Research Associates, Inc., for the Chemstrand Corp. are briefly presented in graph form in this small publication. The study was designed primarily to measure public awareness of, attitudes toward and preferences for tire cord. The composition of the sample surveyed (2,000 car drivers in 2,000 car-owning families) is described, and results of questions on such subjects as what determines choice in tire selection, awareness of tire cord, and others are given.

•

Research in Chemical Processing. Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio. 8½ x 11 in. 18 pp.

The purpose of this publication is to explain the function of Battelle Memorial Institute in sponsored research. The services offered to industry in the various fields of research—process development, unit operations, process control, cost estimating, process evaluation and others—by the Institute are explained. Photographs are used to portray the various facilities available. Four case problems are briefly described with the solutions offered by Battelle. The use of color, artwork and photographs in telling the story is unusually attractive.

•

Ducon—The Name in Dust Control. (Bulletin No. A-9157). Ducon Co., 147 East Second St., Mineola, N. Y. 8½ x 11 in. 6 pp.

This bulletin describes and illustrates the company's complete line of wet and dry type dust collectors and auxiliary equipment, including cyclones, centrifugal and dynamic washers, dust and fiber filters, discharge gates and trickle valves. Two auxiliary units are presented, a two-door discharge gate for all dry flowable materials, particularly those of an abrasive nature, and a trickle valve which uses gravity for automatic operation with no auxiliary power required.

•

New Falcon Ribbon Blenders. Falcon Manufacturing Division, First Machinery Corp., 211 Tenth St., Brooklyn 15, N. Y. 8½ x 11 in. 4 pp.

Falcon sanitary design ribbon blenders, engineered for mixing of powders, granulars, pastes or liquids, are described in this bulletin. A chart of specifications, dimensions and capacities gives relevant data for each of 13 models. A schematic diagram depicts basic construction, and photographs illustrate various component parts. Other equipment—mixing tanks, reactors, comminutors, and kettles—is also illustrated and described.

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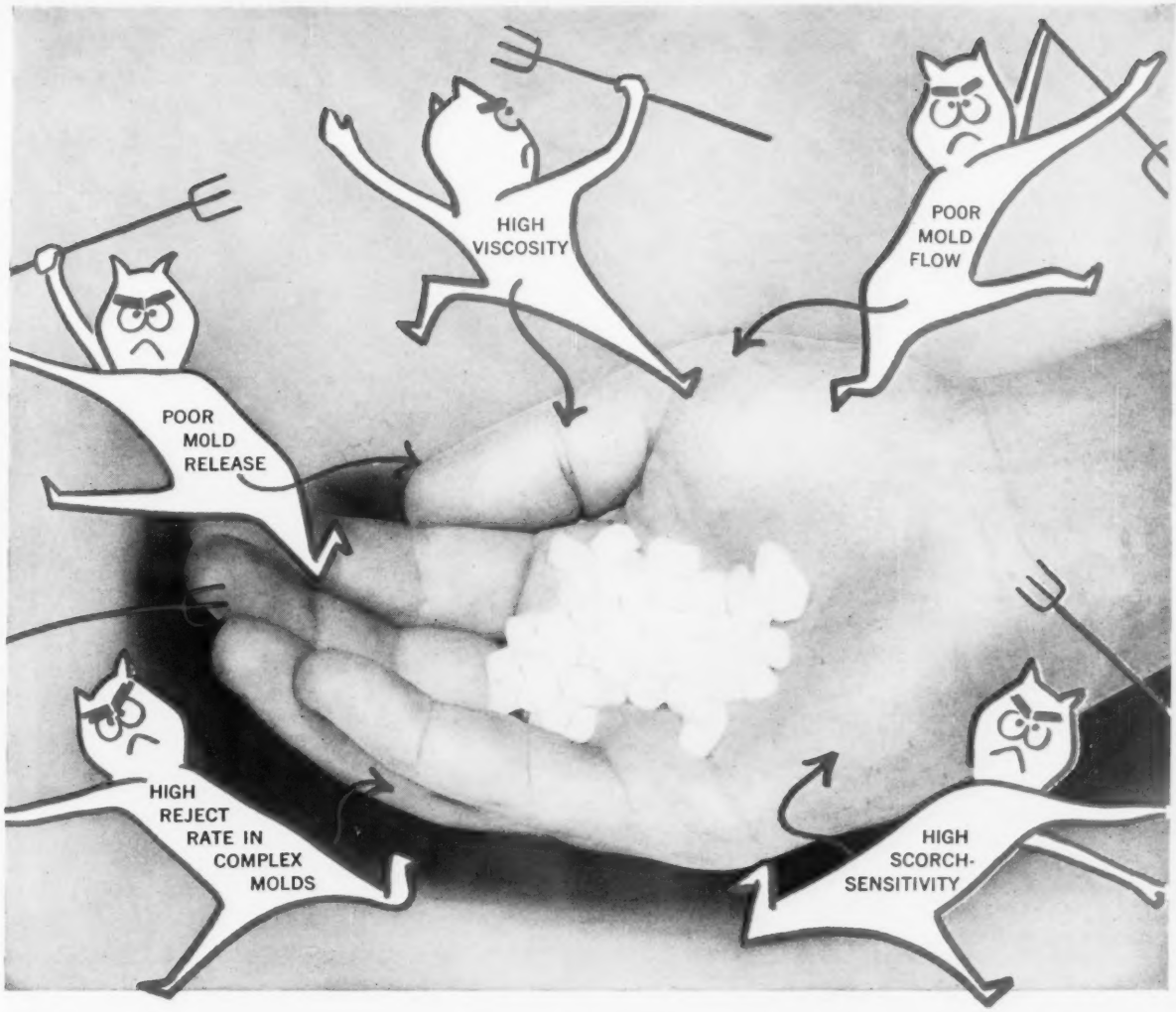

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MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (May 1), the price of spot rubber on the New York Commodity Exchange has moved in a range of 163 points, high for the period being 26.38c reached on May 29, and low being 24.75c reached on May 5 and again on May 6. The average price of spot rubber for the month of May was 25.51c based on 21 trading days. This compares with an average of 26.44c in the previous month.

The trade reports that in spite of the higher price structure, there is an absence of leadership on the buying side. Consumers show no willingness to make purchases beyond fill-in requirements. The outlook for U.S. rubber consumption in June is none too bright and even less is expected in the third quarter of the year if the predicted cut in automobile production can be taken as a criterion.

An undercurrent of feeling exists that foreign markets will necessarily have to dictate the price of natural rubber. U.S. takings of natural rubber continue to progressively decrease when weighed against world takings.

Price Upturn Technical

The upturn in rubber prices is looked upon as largely due to technical factors and not to any change in the rubber situation. Sentiment for the most part is rather bearish. The only restraining influences in recent weeks have been the political disturbances in various parts of the world.

The present inclination is to look for a gradual improvement in the international political situation. Meanwhile, natural rubber production is on the increase. It is questionable that world absorption of natural rubber will increase sufficiently to take care of the higher rate of output. Consequently, it is felt by many in the trade that this will necessarily be reflected in the price structure for natural rubber.

Analysts at Merrill Lynch, Pierce, Fenner & Smith point out that Europe, spurred largely by automobile output, has practically offset the rubber slump in the U.S. The price relationship now existing between natural and synthetic rubber has had an effect, because natural abroad has been several cents cheaper than synthetic exported from the U.S.

Synthetic Prices Stable

In this country, meanwhile, there is strong doubt that synthetic rubber prices will be decreased and there is also a belief that the synthetic preference ratio will have difficulty increasing beyond 65 per cent over the balance of this year.

Nevertheless, the most bearish single influence in the world remains—U.S. automobile output at low levels. So far, this has meant the loss of about 70,000 tons of new rubber as when compared with the previous years' totals. Before the 1959 automobiles make their appearance and automobile inventories have been reduced, it is likely that this gap may increase to 100,000 tons. This would leave little incentive for prices to move in either direction.

NEW YORK, JUNE 2, 1958

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM MAY 1 TO MAY 31

May	Spot	July	Sept.	Nov.	Jan.	Sales
1	24.88	24.90	24.80	24.80	24.70	125
2	25.25	25.25	25.25	25.15	25.10	66
3	....	....	....	....	....	....
4	....	....	....	....	....	....
5	25.25	25.30	25.30	25.30	25.20	26
6	24.75	24.80	24.80	24.70	24.70	42
7	24.75	24.80	24.80	24.80	24.70	25
8	25.25	25.25	25.29	25.20	25.15	39
9	25.50	25.55	25.50	25.49	25.40	99
10	....	....	....	....	....	....
11	....	....	....	....	....	....
12	25.50	25.55	25.53	25.53	25.54	60
13	25.25	25.30	25.30	25.25	25.25	73
14	25.50	25.55	25.55	25.55	25.55	19
15	25.38	25.37	25.40	25.35	25.35	27
16	25.50	25.50	25.45	25.45	25.40	32
17	....	....	....	....	....	....
18	....	....	....	....	....	....
19	25.63	25.55	25.55	25.53	25.50	26
20	25.63	25.70	25.69	25.60	25.50	61
21	26.00	26.10	26.00	25.90	25.90	69
22	25.75	25.80	25.75	25.75	25.70	10
23	25.75	25.80	25.75	25.70	25.70	9
24	..	....	....	....	....	....
25	....	....	....	....	....	....
26	25.75	25.87	25.85	25.75	25.70	6
27	26.00	26.05	25.95	25.90	25.85	45
28	26.13	26.15	26.10	26.05	26.00	32
29	26.38	26.60	26.48	26.30	26.23	71
30	....	....	....	....	....	....
31	....	....	....	....	....	....

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.25⅞
July	.26⅛
Aug.	.26
Thin Latex Crepe:	
Spot	.28
Thin Brown Crepe, No. 2	.20.3/4
Flat Bark Crepe	.18¾

London Market (Standard Smoked Sheets)

July-Sept.	25.82 - 25.97
Oct.-Dec.	25.82 - 25.97

Singapore Market (Standard Smoked Sheets)

July	24.04 - 24.12

Middling Upland Quotations

	Apr. 30	June 2		
	Close	High	Low	Close
July	36.23	36.26	36.18	36.23
Oct.	36.72	36.60	36.54	36.56
Dec.	37.25	36.74	36.66	36.69

Notes & Quotes

Harlow H. Curtice, president of the General Motors Corp., speaking at the company's annual stockholders' meeting held recently, stated that sales of cars and trucks in the second quarter will be lower than in the first, although they should rise in the fourth quarter. The drop-off in automobile sales, he said, is due not to any flaw in the design of automobiles, but rather to general economic conditions. Production in 1958, he said, should be geared to avoid a carryover of 1958 models when the 1959 models make their appearance. Most industry estimates put passenger car sales this year at slightly above 4 million units, compared with 5,982,000 in 1957.

Synthetic Rubber

The Rubber Manufacturers Association reports that in the first four months of the current year a total of 341,894 long tons of synthetic rubber were produced in the United States compared with the 353,768 long tons produced in the first four months of the preceding year. It will thus be seen that the difference in production between the two periods is in the order of 12,000 long tons.

Through April of 1957, a total of 65,481 long tons of synthetic rubber were exported from the United States. In the current period, however, 68,863 long tons were exported, or a net gain of more than 3,000 long tons.

The major disparity between the figures for the first four months of 1957 and 1958 comes in the matter of consumption. Here we find that in the first four months of last year, 319,589 long tons were consumed. In the first four months of the current year, 268,693 long tons were consumed for a drop of about 50,000 long tons.

Stocks on Hand Rise

Stocks as of April 30, 1957, stood at 173,611 long tons. On April 30, 1958, there were 200,822 long tons of synthetic rubber on hand, or about 27,000 long tons more than at the end of the previous period.

On the face of it, the synthetic rubber industry does not seem to be doing too badly in this period of general economic decline. As a matter of fact, the synthetic rubber preference ratio in April rose to a new peacetime high, 64.60 per cent.

Only in the area of consumption was there any appreciable difference between figures in the first four months of 1957 and 1958. Exports, however, showed a modest increase, and while stocks on hand rose, the level to which they have risen is not alarming.

It may be gathered from the figures for 1958 to this point that the swing to synthetic rubber in the United States continues. That is to say that the forces which have been dictating an ever greater synthetic preference ratio have not been abated to this point. What has been happening, as reflected by the statistical picture, is a slow-down dictated by general economic conditions.

This is borne out when we look at the figures for butadiene-styrene rubber. In the first four months of this year, 280,281 long tons were produced, only 2,000 long tons less than in the four months ended April 30, 1957.

Oddly enough, the same 2,000 ton difference exists in the area of consumption. Through April of this year, 230,114 long tons of butadiene-styrene rubber were consumed, 2,000 tons less than in the corresponding four months of the previous year.

Specialty Rubbers Decline

The specialty rubbers, in all instances, have been accounting for the drop in the over-all figures. The biggest drop came in neoprene of which 20,660 long tons were consumed in the first four months of this year against the 26,396 consumed in the first four months of last year.

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STREET_____

CITY_____ ZONE_____ STATE_____

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PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER

Dry Rubber

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [2]
Chemigum N1NS	.6400 [2]
Chemigum N3	.5800 [2]
Chemigum N3NS	.5800 [2]
Chemigum N5	.5800 [2]
Chemigum N6	.5000 [2]
Chemigum N6B	.5000 [2]
Chemigum N7	.5000 [2]
Chemigum N8	.5000 [2]
Herecol N-33	.6800 [2]
Hycar 1001	.5800 [2]
Hycar 1002	.5000 [2]
Hycar 1014	.6000 [2]
Hycar 1041	.5800 [2]
Hycar 1042 and 1043	.5000 [2]
Hycar 1312	.5000 [2]
Hycar 1411	.6200 [2]
Hycar 1432	.5900 [2]
Hycar 1441	.6200 [2]
Paracril AJ	.4850 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril BLT	.5000 [2]
Paracril C	.5800 [2]
Paracril CV	.5900 [2]
Paracril D	.6500 [2]
Paracril 18-80	.6000 [2]
Polysar Krynac 800	.5000 [2]
Polysar Krynac 801	.5800 [2]
Polysar Krynac 802	.5000 [2]
Polysar Krynac 803	.5000 [2]

Butadiene-Styrene Types

Ameripol 1000	.2410 [2]
Ameripol 1001	.2410 [2]
Ameripol 1002	.2435 [2]
Ameripol 1006	.2410 [2]
Ameripol 1007	.2425 [2]
Ameripol 1009	.2475 [2]
Ameripol 1500	.2410 [2]
Ameripol 1501	.2410 [2]
Ameripol 1502	.2410 [2]
Ameripol 1703	.2060 [2]
Ameripol 1705	.2035 [2]
Ameripol 1707	.1910 [2]
Ameripol 1708	.1910 [2]
Ameripol 1710	.1885 [2]
Ameripol 1712	.1885 [2]
ASRC 1000	.2410 [2]
ASRC 1001	.2410 [2]
ASRC 1004	.2410 [2]
ASRC 1006	.2410 [2]
ASRC 1009	.2475 [2]
ASRC 1018	.2700 [2]
ASRC 1019	.2650 [2]
ASRC 1500	.2410 [2]
ASRC 1502	.2410 [2]
ASRC 1503	.2625 [2]
ASRC 1703	.2060 [2]
ASRC 1708	.1910 [2]
ASCR 3110	.2600 [2]
Baytown 1600	.1760 [2]
Baytown 1601	.1760 [2]
Baytown 1602	.1760 [2]
Baytown 1801	.1600 [2]
Carbomix 3750	.1820 [3]
Carbomix 3751	.1545 [3]
Copo 1500	.2410 [2]
Copo 1502	.2410 [2]
Copo 1505	.2610 [2]
Copo 1712	.1885 [2]
Copo 1773	.2060 [2]
Copo 1778	.1910 [2]
Copo 3900	.2310 [2]
FR-S 1000	.2410 [2]
FR-S 1001	.2410 [2]
FR-S 1004	.2410 [2]
FR-S 1006	.2410 [2]
FR-S 1009	.2475 [2]
FR-S 1010	.2600 [2]
FR-S 1012	.2425 [2]
FR-S 1013	.2500 [2]
FR-S 1014	.2810 [2]
FR-S 1015	.2910 [2]
FR-S 1500	.2410 [2]
FR-S 1502	.2410 [2]
FR-S 1703	.2060 [2]
FR-S 1705	.2035 [2]
FR-S 1712	.1885 [2]
Naugapol 1016	.2650 [2]
Naugapol 1018	.2700 [2]
Naugapol 1019	.2650 [2]
Naugapol 1021	.3000 [2]
Naugapol 1022	.2800 [2]
Naugapol 1023	.2850 [2]
Naugapol 1503	.2625 [2]
Naugapol 1504	.2950 [2]
Philprene 1000	.2410 [1]
Philprene 1001	.2410 [1]
Philprene 1006	.2410 [1]
Philprene 1009	.2475 [1]
Philprene 1010	.2600 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1940 [1]
Philprene 1104	.1900 [1]
Philprene 1500	.2410 [1]
Philprene 1502	.2410 [1]
Philprene 1503	.2625 [1]
Philprene 1600	.1930 [1]
Philprene 1601	.1930 [1]
Philprene 1605	.1900 [1]
Philprene 1703	.2060 [1]
Philprene 1706	.2030 [1]
Philprene 1708	.1910 [1]
Philprene 1712	.1885 [1]
Philprene 1803	.1740 [1]
Plioflex 1006	.2410 [2]
Plioflex 1500	.2410 [2]
Plioflex 1502	.2410 [2]
Plioflex 1703	.2060 [2]
Plioflex 1710	.1885 [2]
Plioflex 1712	.1885 [2]
Plioflex 1773	.2060 [2]
Plioflex 1778	.1910 [2]
Polysar Kryflex 200	.2510 [2]
Polysar Krylene	.2410 [2]
Polysar Krylene NS	.2410 [2]
Polysar Krynol 651	.1885 [2]
Polysar Krynol 652	.1910 [2]
Polysar S	.2410 [2]
Polysar S-50	.2410 [2]
Polysar S-X 371	.2550 [2]
Polysar SS-250	.2875 [2]
S-1000	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1009	.2400 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1502	.2300 [2]
S-1506	.2500 [2]
S-1600	.1825 [2]
S-1602	.1825 [2]
S-1703	.1950 [2]
S-1706	.1925 [2]
S-1707	.1800 [2]
S-1709	.1775 [2]
S-1712	.1775 [2]
S-1803	.1650 [2]
S-1804	.1750 [2]
Synpol 1000	.2410 [1]
Synpol 1001	.2410 [1]
Synpol 1002	.2435 [1]
Synpol 1006	.2410 [1]
Synpol 1007	.2410 [1]
Synpol 1009	.2475 [1]
Synpol 1012	.2425 [1]
Synpol 1013	.2500 [1]
Synpol 1061	.2410 [1]
Synpol 1500	.2410 [1]
Synpol 1502	.2410 [1]
Synpol 1551	.2410 [1]
Synpol 1703	.2060 [1]
Synpol 1707	.1910 [1]
Synpol 1708	.1910 [1]
Synpol 1711	.1900 [1]
Synpol 1712	.1885 [1]

Butyl Rubbers

Enjay Butyl 035 and 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Butyl 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [2]
Polysar Butyl 101	.2175 [2]
Polysar Butyl 200 and 300	.2450 [2]
Polysar Butyl 301	.2550 [2]
Polysar Butyl 400	.2450 [2]

Chlorosulfonated Polyethylene

Hypalon 20	.7000 [2]
Hypalon 30	.7000 [2]

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type WRT	.4500 [2]
Neoprene Type WX	.4100 [2]

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.5000 [2]
Thiokol Type FA	.6900 [2]
Thiokol Type ST	1.2500 [2]

Silicone Rubbers*

	(prices l.c.l.)
GE (compounded)	2.50 [2]
GE Silicone Gum (not compounded)	4.00 [2]
Silastic (compounded)	1.90 [2]
Silastic (gums)	3.85 [2]
Union Carbide (gums)	4.00 [2]
Union Carbide (compounds)	2.50 [2]

Latex

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [2]
Chemigum 235	.5400 [2]
Chemigum 236	.5400 [2]
Chemigum 245	.4600 [2]
Chemigum 246	.4600 [2]
Chemigum 247	.4600 [2]
Chemigum 248	.4600 [2]
Hycar 1512	.4600 [2]
Hycar 1551	.5400 [2]
Hycar 1552	.4600 [2]
Hycar 1561	.5400 [2]
Hycar 1562	.4600 [2]
Hycar 1571	.5400 [2]
Hycar 1572	.5100 [2]
Hycar 1577	.4600 [2]
Hycar 1852	.4600 [2]
Nitrex 2612	.4600 [1]
Nitrex 2614	.4600 [1]
Nitrex 2614-A	.4600 [1]
Nitrex 2515	.5100 [1]
Nitrex 2615-A	.5100 [1]
Nitrex 2616	.5400 [1]
Nitrex 2617	.4600 [1]
Nitrex 2617-A	.4600 [1]
Nitrex 2619	.5300 [1]
Nitrex 2620	.4600 [1]
Nitrex 2625	.4600 [1]

Butadiene-Styrene Types

Copo 2101	.3000 [2]
Copo 2102	.3200 [2]
Copo 2105	.3200 [2]
Copo 2108	.3375 [2]
Copo 2110	.3200 [2]
Copo X-800	.2775 [2]
FR-S 2000	.2775 [2]
FR-S 2001	.2775 [2]
FR-S 2002	.3000 [2]
FR-S 2003	.3050 [2]

POLYMERS

FR-S 2004	.3050 [2]
FR-S 2006	.2900 [2]
FR-S 2105	.3200 [2]
Naugatex 2000	.2775 [1]
Naugatex 2001	.2775 [1]
Naugatex 2002	.3000 [1]
Naugatex 2006	.2900 [1]
Naugatex 2105	.3200 [1]
Naugatex 2107	.3200 [1]
Naugatex 2108	.3000 [1]
Pliolite 2000	.2825 [2]
Pliolite 2076	.2950 [2]
Pliolite 2101	.2825 [2]
Pliolite 2104	.3250 [2]
Pliolite 2105	.3250 [2]
Pliolite 2107	.3250 [2]
Pliolite 2108	.3050 [2]
S-2000	.2275 [2]
S-2006	.2150 [2]
S-2101	.2250 [2]
S-2105	.3100 [2]
S-2107	.3200 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.8000 [2]
Thiokol Type WD-2	1.2500 [2]
Thiokol Type WD-6	.8000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

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HOUSTON 17, TEX. — The Alpha Engineering Co., Box 12371
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ATLANTA, GA. — J. R. Angel, Mortgage Guarantee Building
TORONTO 1, CAN. — Hugh Williams & Co., 27 Wellington St. East

MARKETS

(continued)

Reclaimed Rubber

In the first four months of the current year, a total of 77,879 long tons of reclaimed rubber were produced in the United States against the 95,753 long tons produced in the first four months of the previous year, close to an 18,000 long ton decline.

In the first four months of the current year, a total of 78,316 long tons of reclaimed rubber were consumed in the United States, while during the comparable period of 1957, 94,427 long tons were consumed, about 16,000 long tons more.

As of April 30, 1958, there were 27,184 long tons of reclaimed rubber in stocks, against the 30,258 long tons on hand as April 30, 1957.

On the basis of the figures available to this point it would seem that a total of 235,000 long tons of reclaimed rubber will be produced this year and a similar quantity consumed. This is in line with estimates made earlier in the year and in accord with the general economic structure.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

Quiet conditions continue to prevail in the scrap rubber market. One eastern reclaimer is not accepting mixed automobile tires. Instead, this reclaimer is working from inventories. The tube section of the market is not exhibiting too much life and prices are holding at previously established levels.

According to figures furnished by the Rubber Manufacturers Association, 71,520 long tons of scrap rubber were consumed in the first four months of this year. Stocks as of April 30, 1958, stood at 58,662 long tons, equal to about three months consumption.

From what can now be gathered it seems that a total of 210,000 long tons of scrap rubber will be consumed this year. It does not appear as though this figure will be exceeded by any substantial sum in view of estimated automobile production for the balance of the year and the figures predicted for reclaimed rubber consumption.

(Prices Delivered Akron)

Mixed tires	ton	14.00
Light colored carcass	lb.	.04¼
No. 1 peelings	ton	28.00
No. 2 peelings	ton	25.00
No. 3 peelings	ton	18.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	19.00
Passenger S.A.G.	ton	17.00
Natural Rubber Red Tubes	lb.	.07½
Natural Rubber Black Tubes	lb.	.06¾
Butyl Rubber Tubes	lb.	.04¾

Tire Fabrics

The big news in the tire fabric field was the announcement of a price cut of 10c a pound in nylon tire yarn by E. I. du Pont de Nemours & Co., Inc. The price cut by DuPont was matched by a similar reduction announced by the Chemstrand Corp., second-largest nylon producer in the United States.

The move to cut nylon yarn prices was immediately interpreted by many in the trade as an attempt by nylon producers to crack the big market in original equipment tires. Rayon cord now goes into about 99 per cent of all the tires on original equipment passenger cars.

DuPont's new price for its 840 denier nylon tire yarn is now $1.20, down from $1.30 previously. A 1650 denier rayon yarn sells for about 58c a pound, while the 1100 denier rayon yarn sells for about 63c a pound. The difference in finished tires using either rayon on nylon is not nearly so great as the yarn price spread would indicate, however, in that less nylon than rayon is needed to make a tire.

Chevrolet Test Abandoned

In the May issue of this journal there appeared an article reporting that the General Motors Corp. was conducting an experimental program which would have an important bearing on the use of nylon cord tires on original equipment passenger cars. In the test, 40,000 1958-model Chevrolets were equipped with unmarked nylon cord tires to check consumer reaction.

News has now come from Detroit that the test program has apparently been abandoned. The implication is, therefore, that Chevrolet will stick with rayon cord tires on its 1959 models. It was reported that the principal reason for the Chevrolet decision was a lack of agreement between the General Motors division and tire companies over prices.

Chevrolet reportedly wanted to offer nylon cord tires on its 1959 models at no extra cost over rayon, and were said to be unwilling to pay a premium for the tires. The tire companies, however, were said to have notified Chevrolet that to supply the nylon cord tires at rayon prices, they would have to use less cord and thus weaken the structure of the tires to such a degree that they could not guarantee performance.

It should be noted that tire cord is by far the largest single market that rayon producers have. In 1957, it accounted for about 36 per cent of all the rayon sold. Of all the tire cord consumed last year, nylon accounted for about 20 per cent with most of this quantity going into replacement passenger car tires and in truck and other heavy duty tires.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.73
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.70

Rayon Graded Fabric

1100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.68
9.25 oz. (per square yard)	lb.	.66
11.65 oz. (per square yard)	lb.	.62
14.4 oz. (per square yard)	lb.	.71

Liquid Latex

Natural: The Rubber Manufacturers Association reports that in the first four months of the current year a total of 23,156 long tons of natural rubber latex were imported into the United States compared with the 25,470 long tons imported in the first four months of the preceding year.

As for consumption, in the first four months of this year 21,812 long tons of natural latex were consumed in the United States compared with the 26,380 long tons consumed in the first four months of 1957. As of April 30, 1958, there were 17,166 long tons of natural latex on hand against 12,064 as of April 30, 1957.

Natural rubber latex is currently selling at about 32 to 33c per pound in car load lots at East Coast ports, much the same level which has been in evidence for the past few months. Price, it would seem, is therefore no present obstacle to consumption.

The general economy, rather than the latex market itself, is still shaping the future. Latex, like all other types of rubber, is faced with the general slowdown which bears upon the economy with the end result that the statistical picture, at this point, is not too encouraging. It would appear that from present consumption rates one would conclude that some 65,000 long tons of natural rubber latex will be consumed in the United States in 1958.

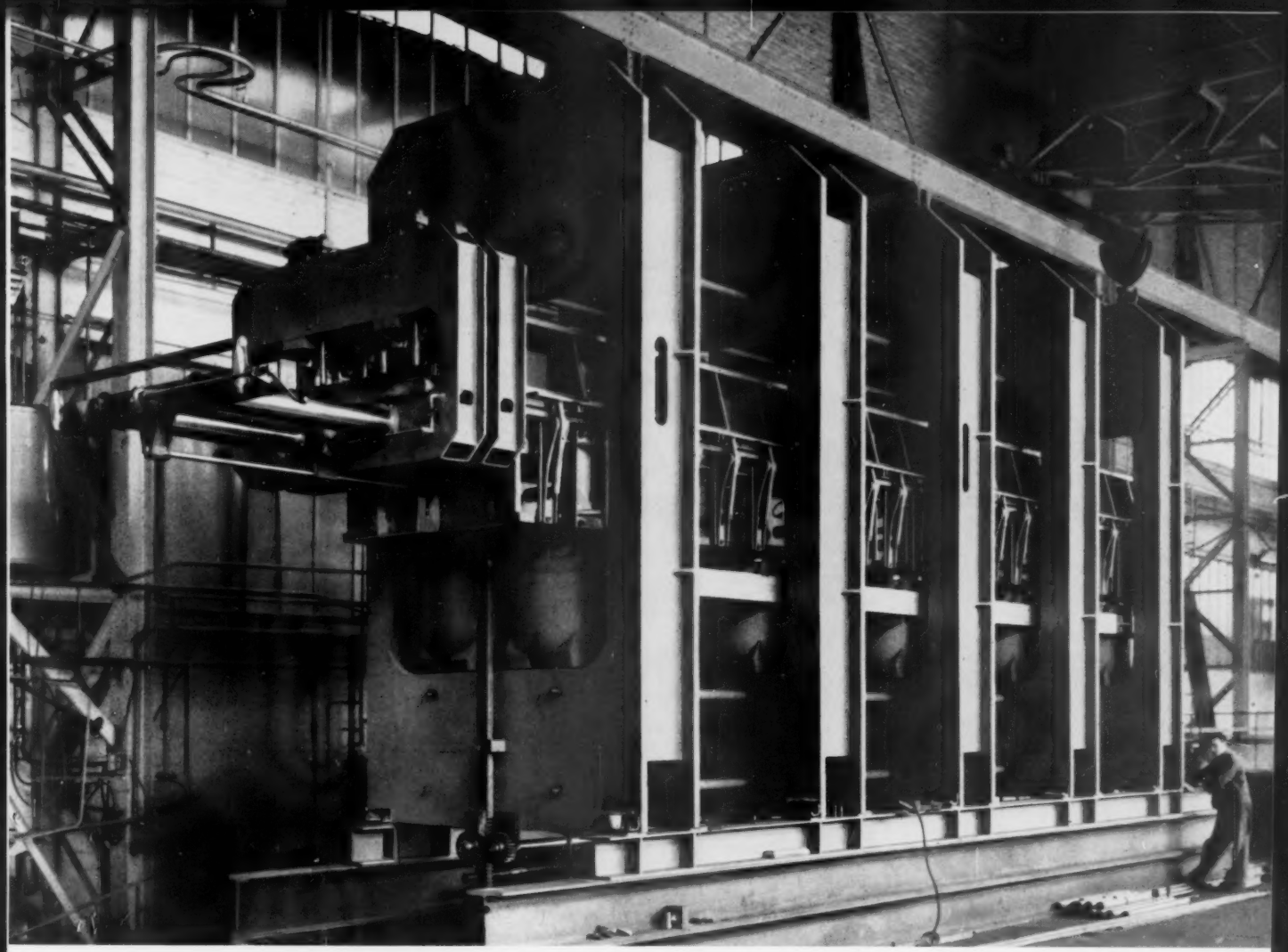
Synthetic: The same set of economic conditions which govern the natural latex market also play upon the synthetic latices. We see, for example, that in the first three months of this year, 14,621 long tons of S-type latex were consumed against the 18,827 long tons consumed in the first three months of the preceding year. Reductions have also been noted in the amounts of N-type and neoprene latices consumed this year.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the relatively small range of 55 points since our last report (May 1), high for the period being 36.60c reached on May 19, and low being 36.05c reached on May 1 and on three other days during the month. The average price of middling uplands for the month of May was 36.27c based on 21 trading days. This compares with an average of 36.00c in the previous month.

A House Foreign Affairs Committee study group has cited Russian purchases of $2 million worth of Sudanese long staple cotton in 1957 as an example of Russian economic penetration efforts in the near East and Africa. The study group noted that the Russian purchases came at a time when fluctuations in world cotton demand caused considerable concern for the future of the Sudanese economy, which is based on cotton.

Legislation for the cotton trade has taken an uncertain turn. The Senate Agriculture Committee has started hearings on various cotton bills, but emphasis seems to be placed on a proposal of the American Farm Bureau Federation which calls for farmers to have a choice of either a high loan and controlled acreage or a lower loan and higher acreage. A Representative from Texas has, meanwhile, held up a bill which calls for paying a farmer subsidy in lieu of a loan.



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MARKET PRICES

CHEMICALS & COMPOUNDING INGREDIENTS

JUNE 2, 1958

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carload; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l., less than carload; M.B. masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*Trademark. †For Export Only.

The arrangement of this section closely follows the Chemical Section of the 1957-58 RUBBER RED BOOK. Readers are referred to that edition for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

ACCELERATORS

A-1 (Thiocarbanilide)*	lb.	.72	.79
A-32*	lb.	.66	.80
A-100*	lb.	.52	.66
Accelerator No. 8*	lb.	——	1.25
Accelerator—49*	lb.	.59	.60
Accelerator 89*	lb.	——	1.20
Accelerator 108*	lb.	.92	.97
Accelerator—552*	lb.	——	2.25
Accelerator—808*	lb.	.66	.68
Accelerator—833*	lb.	1.17	1.19
Accelerator B*	lb.	——	.89
Altax*	lb.	.54	.56
Ancap*(†)	lb.	.38	.40
Ancatax*(†)	lb.	.48	.50
Ancazate BU (ET & ME)*(†)	lb.	——	1.07
Ancazide ET*(†)	lb.	——	1.07
ME*(†)	lb.	——	1.14
Arazate*	lb.	——	2.25
Arquad 12*	lb.	.55	.61
Beutene*	lb.	.66	.71
Bismate, Rodform*	lb.	——	3.00
Butazate*	lb.	.87	.92
Butyl Eight*	lb.	1.10	1.35
Butyl Namate	lb.	.45	.50
Butyl, Ethyl & Methyl Zimate Slurry (50% solids content)	lb.	.85	.89
Captax*	lb.	.44	.46
C-P-B*	lb.	1.95	2.00
Cumate, Rodform*	lb.	——	1.45
Diorthotolylguanidine	lb.	.62	.63
Dipac*	lb.	——	.85
Diphenylguanidine	lb.	.49	.50
El-Sixty*	lb.	.62	.69
Ethazate*	lb.	——	1.04
50D*	lb.	.87	.92
Ethyl Thiurad*	lb.	——	1.04
Ethyl Tuex*	lb.	——	1.04
Ethylac*	lb.	.93	.95
Guantal*	lb.	.62	.69
Harvex*	lb.	.70	.76
Hepteen Base*	lb.	1.85	1.90
Kure-Blend MT*	lb.	——	.70
Ledate, Rodform*	lb.	——	1.04
MBT-XXX*	lb.	.53	.55
Merac*	lb.	.75	1.05
Mercaptobenzothiazole	lb.	.42	.44
Mercaptobenzothiazyl Disulfide	lb.	.52	.54
Mertax*	lb.	.55	.57
Methazate*	lb.	——	1.04
Monex*	lb.	——	1.14
Mono Thiurad*	lb.	——	1.14
Morfex*	lb.	.65	.67
2-MT	lb.	——	1.00
NA-22* (for neoprene)	lb.	——	1.05
NOBS No. 1*	lb.	.76	.78
Special*	lb.	.80	.82
O-X-A-F	lb.	.55	.57
Pennac SDB*	lb.	.45	.48
Pentex*	lb.	——	1.24
Flour*	lb.	——	.30
Permalux (Neoprene)*	lb.	——	2.25
Phenex*	lb.	.55	.57
Polyac*	lb.	——	1.85
R-2 Crystals*	lb.	——	4.35
Rotax*	lb.	.55	.57
RZ-50-A*	lb.	——	1.00
B*	lb.	——	1.00
Santocure*	lb.	.76	.83
NS*	lb.	.80	.87
Selenac* (Ethyl, Methyl)	lb.	——	4.25
Seleram, Ethyl	lb.	——	3.00
Setsit-5*	lb.	.75	1.05
9*	lb.	.85	1.15
SPDX-GH*	lb.	.74	.76
GL*	lb.	1.20	1.30
Tellurac*	lb.	——	1.45
Tepidone*	lb.	.45	.48
Tetrone A*	lb.	——	1.98
Thiofide*	lb.	.54	.56
S*	lb.	.64	.66
Thionex*	lb.	——	1.14
Thiotax*	lb.	.44	.51
Thiram, Ethyl	lb.	——	1.04
Methyl	lb.	——	1.14
Thiurad*	lb.	——	1.14
Thiuram E*	lb.	——	1.04
M*	lb.	——	1.14
Trimene*	lb.	.56	.62
Base*	lb.	1.03	1.10
Triphenyl Guanidine	lb.	——	.90
Tuads* (Ethyl)	lb.	——	1.04
Tuads* (Methyl)	lb.	——	1.14
Tuex*	lb.	——	1.14
Ultex*	lb.	1.00	1.10
Unads*	lb.	——	1.14
ZB*	lb.	——	.85
ZE*	lb.	——	.85
ZM*	lb.	——	.85
Vulcacure NB*	lb.	.45	.45
NS*	lb.	.75	1.05
ZB*, ZE*, ZM*	lb.	.85	.89
Z-B-X*	lb.	2.45	2.50
Zenite*	lb.	.54	.56
Zenite A*	lb.	.69	.71
Zenite Special*	lb.	.55	.57
Zetax* (uncoated)	lb.	.55	.57
Zimate* (Butyl)	lb.	——	1.04
Zimate* (Ethyl)	lb.	——	1.04
Zimate* (Methyl)	lb.	——	1.04
Ziram, Butyl	lb.	——	1.04
50% Dispersion	lb.	.87	.89
Ziram, Ethyl	lb.	——	1.04
50% Dispersion	lb.	.87	.89
Ziram, Methyl	lb.	——	1.04
50% Dispersion	lb.	.87	.89

ACTIVATORS

Blue Lead Sublimed (dlvd.)	lb.	.17¼	.18¼
Cottonseed Fatty Acids			
Wochem 210*	lb.	.16¾	.19¾
211*	lb.	.16¾	.19¾
Fish Oil, Hydrogenated, Fatty Acid			
DAR-S* (dlvd.)	lb.	.12¾	.15¼
DAR-HY* (lvd.)	lb.	.16	.18½
Hydrofol Acids* (dlvd.)	lb.	.11¾	.25¼
Hyfac 430* (dlvd.)	lb.	.18	.20½
Neo-Fat H.F.O.* (dlvd.)	lb.	.14½	.15¾
Neutrex* (dlvd.)	lb.	.15¾	.18¼
Stearex Beads* (dlvd.)	lb.	.09¾	.10¾
Stearite*	lb.	.12	.14
Talene* (dlvd.)	lb.	.17	.19½
Lime, Hydrated			
Arrowhead*	ton	——	21.00
Marblehead*	ton	——	17.75
Sierra*	ton	——	22.50
Litharge			
Eagle-Picher* (c.l.)	lb.	.18	——
SB* (dlvd.)	lb.	——	.18½
Magnesium Oxide, Heavy			
General Magnesite 500*	lb.	.05½	.06
600*	lb.	.06½	.07
Kaiser 325*	lb.	.057	.073
Michigan No. 15*	lb.	.05½	.06½
Magnesium Oxide, Light			
Carey Mag*	lb.	.25¼	.26
General Magnesite* (neoprene grade)	lb.	.30	.32
General Magnesite No. 101*	lb.	.25¼	.26
Genmeg MLW*	lb.	.25¼	.26

ACTIVATORS (Cont'd)

Magnesium Oxide, Light (cont'd)			
K & M* (neoprene grade)	lb.	.29¼	.30
Light Calcined Magnesia No. X-01*	lb.	.25¼	.26
Maglite D*	lb.	.23½	.26¼
K*	lb.	.25¾	.28¾
L*	lb.	.29¾	.30½
M*	lb.	.26¾	.30¾
Marmag*	lb.	.22½	.25
Michigan No. 30*	lb.	.25¼	.26
Neomag Powder*	lb.	.29¼	.30
Pellets*	lb.	.31¼	.32
Michigan No. 40*	lb.	.29¼	.30
Oleic Acid			
Emersol 210* (dlvd.)	lb.	.16½	.19
Groco Red Oil	lb.	.16½	.19
Neo-Fat 92-04*	lb.	.20½	.22½
94-04*	lb.	.18½	.20½
Wochem 310, 311	lb.	.16½	.19
Palm Fatty Acids			
Groco 45*	lb.	.15¾	.18¼
Neo-Fat*	lb.	.15¾	.17¾
Wochem 280*	lb.	.15¾	.18¼
281*	lb.	.16¼	.18¾
Potassium Oleate (dms.)	lb.	.30	.73
Red Lead			
Eagle-Picher* (c.l.)	lb.	.19	——
No. 2 RM* (dlvd.)	lb.	——	.18½
Sodium Laurate, 75%	lb.	.64	.89
Sodium Oleate, 75%	lb.	.54	.79
Paste (dms.)	lb.	.39	.64
Sodium Stearate, 75%	lb.	.54	.89
Stearic Acid, Single Pressed			
Emersol 110* (dlvd.)	lb.	.15½	.18
Groco 53*	lb.	.15½	.18
Neo-Fat 18-53*	lb.	.14¼	.16¾
Standard Pearlstearic* (dlvd.)	lb.	.16	.18½
Stearex B* (dlvd.)	lb.	.15½	.16¾
Wochem 730*	lb.	.13¾	.15¾
Stearic Acid, Double Pressed			
Choice Pearlstearic* (dlvd.)	lb.	.16½	.19
Emersol 120* (dlvd.)	lb.	.16	.18½
Groco 54*	lb.	.16	.18½
Hydrofol Acid 51RG	lb.	.13¼	.15¾
Neo-Fat 18-54*	lb.	.15¼	.17¼
Wochem 731*	lb.	.15	.17½
Stearic Acid, Other			
Extra Pearlstearic* (dlvd.)	lb.	.18¾	.21¼
Groco*	lb.	.12	.14
Neo-Fat 18*	lb.	.18½	.20½
18-58*	lb.	.14¼	.16¾
18-61*	lb.	.16¾	.18¼
Stearite*	lb.	.11¾	.13¼
Wochem 720*	lb.	.11¾	.13¾
721*	lb.	.11¾	.13¾
732*	lb.	.16	.18½
White Lead Basic Carbonate	lb.	.19	.20
White Lead Basic Sulfate	lb.	.17¼	.18¼
Zinc Laurate Laurex*	lb.	.33	.34
Zinc Stearate	lb.	.41	.46
Aquazinc K.C.*	lb.	.30	.55
Crown Brand*	lb.	.39	.44

Unclassified Activators

Actifat* (dms.)	lb.	——	.18
Aktone*	lb.	.21¼	.23¼
Barak*	lb.	——	.62
Curade*	lb.	.57	.59
Dibenzo G-M-F	lb.	——	2.60
D-B-A*	lb.	——	1.95
G-M-F*	lb.	——	2.60
Dibutylamine (dlvd.)	lb.	.55½	.56½
MODX*	lb.	.36	.38
Neo Fat 42-07*	lb.	.10¼	.12¼
Ridacto* (dms.)	lb.	.25	.26
Snodatte* (dlvd.)	lb.	.19	.21½
Vimbra	lb.	.32	.38½
Vulklor*	lb.	.88	.98

ANTI-COAGULANTS

Aqua Ammonia* (dms.)	lb.	.031	.035
M.B.M.C.* (l.c.l.)	lb.	.54	.76

ANTI-FOAMING AGENTS

Aero Anti Foam H*	lb.	——	.20
Regular*	lb.	——	.12
Anhydrol 6991*	lb.	.51	.56
D.C. Antifoam A*	lb.	5.45	6.65
Antifoam A Emulsion*	lb.	2.05	4.00
Antifoam AF Emulsion*	lb.	2.05	2.85
Defoama W-1701*	lb.	——	.12½

Hamilton Rubber bought their Taylor Belt Press Control *Pre-Packaged!*

HAMILTON Rubber Manufacturing Corporation of Trenton, N. J. ordered this new Taylor Automatic Belt Press Control System for rubber-coated conveyor belting; rubber impregnated transmission belting; solid sheet rubber; cloth inserted rubber sheeting; diaphragm sheeting. Hamilton Rubber saw many advantages in Taylor's recommendation that the system be prewired, prepiped and mounted on a panel. This reduced installation time, and simplified start-up.

Taylor's automatic Press Control System offers these operating advantages:

1. The press is "bumped" to remove gases from the belting, and the platens are brought to temperature and held for a pre-determined time. Automatic operation of the presses eliminates errors by the operator, thus insuring a uniform, high quality product.

2. The heating controls are designed to prevent overheating and overcuring, as well as blistering due to local overheating.

3. Blowdown control of condensate removal assures uniform platen temperatures by eliminating pockets of air and water.

4. Taylor Recording Controllers give you a complete record of the number of cures run per day, as well as the temperature, time and force exerted during each cure. This is a valuable aid both in planning products and in evaluating down time.

There's a Taylor Control System for every phase of the rubber industry. For more information on what Taylor Controls can do for your operation, see your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N.Y., or Toronto, Ontario.

Taylor Instruments

MEAN

ACCURACY FIRST

VISION · INGENUITY · DEPENDABILITY

ANTI-FOAMING AGENTS (Cont'd)

Defoamer A-25*	lb.	——	3.00
Defoamer 630*	lb.	——	.14
Deltyl Prime	lb.	.70	.80
G-E Antifoam SS-24*	lb.	5.30	6.65
SS-66*	lb.	5.30	6.65
60 Emulsion*	lb.	2.05	3.75
Igepol CO-210	lb.	——	.36
Kessco X-3* (dms.)	lb.	——	.35
X-180*	lb.	——	.29¼
X-181*	lb.	——	.38½
Nopco 1407*	lb.	.19½	.20½
1497-V*	lb.	.13¼	.14¼
1907-B*	lb.	.18¼	.19¼
JMK*	lb.	.48	.49
JMU*	lb.	.22½	.23½
JMY*	lb.	.19¼	.20¼
Pluronic L61*	lb.	.33½	.39
RS-968*	lb.	.38	.38½
Terpinol Prime No. 1	lb.	.35	.50
Tributyl Phosphate (dms.)	lb.	.52½	.53½

ANTIOXIDANTS

Agebest 1293-22A*	lb.	1.90	2.00
AgeRite Alba*	lb.	2.40	2.50
Gel*	lb.	.70	.72
Hipar*	lb.	1.05	1.07
H.P.*	lb.	.79	.81
Powder*	lb.	.57	.59
Resin*	lb.	.88	.90
Resin D*	lb.	.57	.59
Spar*	lb.	.57	.59
Stalite*	lb.	.57	.59
Stalite S*	lb.	.57	.59
Superlite*	lb.	.57	.59
White*	lb.	1.50	1.60
Akroflex C*	lb.	.85	.87
CD*	lb.	.79	.81
Aminox*	lb.	.57	.62
Antioxidant 425*	lb.	2.47	2.50
Antioxidant 2246*	lb.	1.50	1.53
Antox*	lb.	.59	.61
Aranox*	lb.	3.25	3.30
Benzoquinone	lb.	1.50	1.75
Betanox Special*	lb.	.91	.96
B-L-E*	lb.	.57	.62
B-X-A*	lb.	.55	.57
Catalin CAO No. 1*	lb.	.91	.95
CAO No. 5*	lb.	1.49	1.50
Deenax*	lb.	.95	1.05
Di-tert-Butyl-para-Cresol	lb.	.86	1.16
Eugenol C-95%*	lb.	2.30	2.50
Flectol H*	lb.	.57	.64
Flexamine*	lb.	.79	.84
Ionol* (dms.)	lb.	.91	.95
Neozone A*	lb.	.64	.66
C*	lb.	.86	.88
D*	lb.	.57	.59
Nevastain A*	lb.	.51	.61
B*	lb.	.51	.70
Nullapon BF-12*	lb.	——	.21½
BF-13*	lb.	——	.25½
BF-78*	lb.	——	.55
BF-Acid*	lb.	——	.85
Octamine*	lb.	.57	.62
Oxidex*	lb.	——	3.60
PDA-10*	lb.	.46	.48
Permalux*	lb.	——	2.25
Polygard*	lb.	.52	.62
Santoflex AW*	lb.	.79	.86
DD*	lb.	.57	.64
75*	lb.	1.01	1.08
Santovar-A*	lb.	1.55	1.57
Santowhite Crystals*	lb.	1.55	1.62
Santowhite L*	lb.	.57	.64
MK*	lb.	1.25	1.32
Powder*	lb.	1.55	1.62
Sequestrene AA*	lb.	.76	.85
NA2*	lb.	.62	.70
NA3*	lb.	.61	.69
Stabilite*	lb.	.55	.57
Alba*	lb.	.74	.79
FLX*	lb.	.76	.78
L*	lb.	.63	.65
White*	lb.	.52	.54
White Powder*	lb.	.41	.43
Stabilizer No. 1*	lb.	1.55	1.80
Stabilizer No. 9-A*	lb.	.80	1.05
Styphen I*	lb.	.51	.55
Sunolite*	lb.	.16	.22
Tecquinol*	lb.	.82½	.84½
Tannic Acid, Tech.	lb.	.46	.48
Tenamene 3*	lb.	.91	.95
Thermoflex A*	lb.	1.05	1.07
V-G-B*	lb.	.75	.77
Wing-Stay S*	lb.	.53	.57

ANTIOZONANTS

Eastozone 30*	lb.	1.24	1.26
31*	lb.	1.24	1.26
32*	lb.	1.72	1.74
Fura-Tone NC-1008*	lb.	.28	.39
NC-1012*	lb.	.46	.69
UOP 88* & 288* (dms)	lb.	——	1.26

ANTI-SCORCHING AGENTS

Armeen HT*	lb.	.34	.40
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder PD*	lb.	.37	.39
W*	lb.	——	.42
Sodium Acetate 60-62% Crystals	lb.	.08	.08½

ANTISEPTICS AND GERMICIDES

A.P.C. 6901*	lb.	.32	.38
Arquad S*	lb.	.38	.44
Formaldehyde (dms.)	lb.	.06	.076
G-4* (bbls.)	lb.	1.09	1.29
G-11*	lb.	1.98	2.08
Halane*	lb.	.40	.47
Ortho Cresol (26°—27°)	lb.	.14	.16¼
Preventol GD	lb.	——	1.09
Retarder D*	lb.	.42	.50
Vancide	lb.	——	.80

ANTI-WEBBING AGENTS (for Latex)

DC 7 Compound*	lb.	5.13	6.50
Webnix 34-L*	lb.	1.25	1.75
69-C*	lb.	1.50	2.25

AROMATICS (DEODORANTS)

Airkem 115*	gal.	——	6.50
122*	gal.	——	6.50
186*	gal.	——	6.50
Alamask AA*	lb.	——	3.00
AF*	lb.	——	2.50
AO*	lb.	——	1.50
AR*	lb.	——	.50
BG*	lb.	——	1.15
BGM*	lb.	——	.60
CY*	lb.	——	2.40
DI*	lb.	——	3.35
DL*	lb.	——	1.95
H*	lb.	——	5.50
LD*	lb.	——	.75
ND*	lb.	——	2.75
O*	lb.	——	6.50
OS*	lb.	——	5.25
Bouquet 149*	lb.	——	3.00
Coumarin*	lb.	——	3.70
Curodex 19*	lb.	4.75	4.90
188*	lb.	5.75	5.90
198*	lb.	6.75	6.90
Deodorant 65*	lb.	——	1.85
Deodorant L-37*	lb.	2.15	2.25
L-44*	lb.	2.65	2.75
N.L.T.X.*	lb.	1.90	2.00
Deodorant Oil GD 6422*	lb.	1.90	2.20
GD 6423*	lb.	1.60	1.90
GD 6575*	lb.	2.40	2.90
GD 31063*	lb.	2.25	2.75
Ethavan*	lb.	6.20	6.25
Latex Perfume 17326	lb.	——	4.00
18301	lb.	——	3.00
22258	lb.	——	2.50
Naugaromes* (dms.)	lb.	.60	3.00
Neutroleum Delta*	lb.	——	2.60
Gamma*	lb.	——	3.60
Parador A*	lb.	1.80	2.10
C*	lb.	2.00	2.50
E*	lb.	.25	.40
GD 5280*	lb.	2.00	2.50
GD 53481*	lb.	1.70	2.00
Perfume Oil Bouquet Vanilla M*	lb.	1.60	1.70
Rodo No. 0*	lb.	4.00	4.50
No. 10*	lb.	5.00	5.50
Rubbarome* (dms.)	lb.	.60	3.80
Rubber Perfume 12*	lb.	——	4.35
Russian Leather 7*	lb.	——	4.35
Vanillin	lb.	2.75	2.80

BLOWING AGENTS

Ammonium Bicarbonate	cwt.	——	8.00
Better Blend Soda* (c.l., bags)	cwt.	——	2.55
Blowing Agent No. 81105	lb.	.32	.35
Celogen*	lb.	——	1.95
AZ*	lb.	——	1.95
Diazo Amino Benzene	lb.	——	.73
Kempore R-125	lb.	——	1.95
Neo Fat 42-12*	lb.	.10¼	.12¼
Opex 40	lb.	——	.76
Sodium Bicarbonate, U.S.P. (c.l., bags)	cwt.	——	2.40
Sponge Paste*	lb.	——	.20
Unicel ND*	lb.	——	.76
S*	lb.	——	.20
Urea	lb.	.06	.07

BONDING AGENTS

Base 6986*	lb.	.27	.32
Braze*	gal.	6.00	9.00
Chemlok 201, 203, 220, 401, 607	gal.	5.00	24.00
614	lb.	4.35	4.75
Cover Cement*	gal.	2.50	4.00
Durez 12987*	lb.	——	.54
Gen-Tac Latex*	lb.	.70	.75
Hylene M*	lb.	3.50	3.75
M-50*	lb.	1.90	2.15
Penacolite B1A*	lb.	——	.95
R-2710*	lb.	——	.95
Pliobond 20*	gal.	2.91	4.23
30*	gal.	3.65	4.97
Rex Compounds*	gal.	1.30	1.90
Thixons*	gal.	3.30	9.00
Ty-Ply Q (BN & S)*	gal.	6.75	8.00
Tygobond 30*	gal.	5.50	7.45
Vinculux	gal.	——	4.95

COAGULANTS

Acetic Acid—56% (bbls.)	cwt	9.00	11.00
Glacial 99½% (dms.)	lb.	.12	.13
Calcium Nitrate, Tech. Flake	lb.	.12½	.15
Hydroxyacetic Acid—70% (dms.)	lb.	——	.09½
Zinc Nitrate, Tech. Flake	lb.	——	.20

COLORING AGENTS

Black

Aquablak B*	lb.	.09¾	.10¾
M*	lb.	.10½	.11
R*	lb.	.10¾	.11¾
S*	lb.	.11¼	.12¼
Black Shield 4-35* (dms)	lb.	.09	.09½
No. 5	lb.	.10	.10½
No. 6	lb.	.09	.09½
L-1404B	lb.	.10½	.11
Carbon Black—See *Reinforcing Agents*			
Cooke 1026*	lb.	——	2.50
Lampblack No. 10*	lb.	.06	.09
Mapico Black Iron Oxide* (50 lb. bags)	lb.	.14¼	.14½
Pure Black Iron Oxide	lb.	.14¼	.14½

Blue

Akron Masterbatches*	lb.	2.23	2.78
Toners*	lb.	2.30	6.35
Blue Powders	lb.	2.20	3.75
Cooke M.B. Blue*	lb.	2.20	3.75
Disco Blues	lb.	2.20	3.45
Monastral Rubber Blue			
CPL*	lb.	1.95	1.95
PCD, Dispersed*	lb.	——	2.55
Peacoline Blue*	lb.	——	3.85
Ramapo Blue*	lb.	2.75	3.00
Rubber Blue GD* (Disp.)	lb.	——	4.75
Rubber Blue X-1999*	lb.	——	1.90
Rubber Dispersed Blues	lb.	2.52	2.78
Solfast Sky Blue*	lb.	3.00	3.60
Stan-Tone MBS*	lb.	1.55	4.55
GPE*	lb.	——	2.50
PC*	lb.	1.40	1.80
Ultramarine	lb.	.14	.30
Vansul Blue M.B.*	lb.	.95	2.60

Brown

Brown Iron Oxide	lb.	.15¼	.15½
Mapico Brown* (50 lb. bags)	lb.	.15¾	.15½
Stan-Tone GPE*	lb.	——	3.00
Vansul Brown M.B.* (Organic)	lb.	——	2.15

Green

Akron Masterbatches*	lb.	1.38	3.08
Toners*	lb.	1.35	4.95
Cooke M.B. Green*	lb.	1.60	2.80
1013*	lb.	——	2.80
Disco Greens	lb.	1.55	2.80
Green Powders	lb.	1.35	3.95
Monastral Rubber Green			
GSD* (Dispersed)	lb.	——	2.80
GSL*	lb.	2.20	2.20
Permansa Green CP-594*	lb.	——	1.35
Pigment Green B*	lb.	1.45	1.45
GL-652D*	lb.	.90	.95
Ramapo Green*	lb.	——	3.50
Rubber Dispersed Greens	lb.	1.23	3.08
Rubber Green FD* (Disp.)	lb.	——	2.05
Rubber Green X-1292*	lb.	——	1.75
Solfast Green*	lb.	——	3.95
Stan-Tone MBS*	lb.	1.55	1.35
GPE*	lb.	3.00	4.50
PC*	lb.	1.70	3.80
Vansul Green M.B.*	lb.	1.05	2.90

Maroon

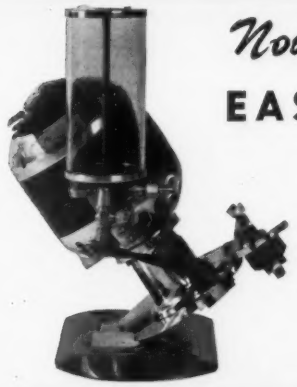
Akron Masterbatches*	lb.	——	4.10
Toners*	lb.	2.00	4.00
Pyrolux Maroon*	lb.	——	3.65
Vansul Maroon M.B.*	lb.	——	3.35

Orange

Akron Masterbatches*	lb.	2.42	2.77
Toners*	lb.	2.82	4.00
Benzidene Orange	lb.	——	3.10
Cooke MB*	lb.	2.25	2.35
1021*	lb.	——	2.25
Dianisidine Orange*	lb.	——	2.70
Disco Oranges	lb.	2.30	2.85
Mercadium X-2667*	lb.	——	1.61
Molybdate Orange	lb.	——	.48
Oswego Orange X2065*	lb.	——	3.15
Rubber Orange OD* (Disp.)	lb.	——	2.25
Stan-Tone Cadmium Dry*	lb.	2.10	2.20
Cadmium Paste*	lb.	2.47	3.20
GPE*	lb.	1.20	4.35
PC*	lb.	.75	2.75
Vansul Orange M.B.*	lb.	2.40	2.45

Red

Akron Masterbatches*	lb.	1.00	3.53
Toners*	lb.	.88	5.60
Arcturus Reds*	lb.	——	1.20
Antimony Trisulfide	lb.	.72	.78
R.M.P. Sulfur Free*	lb.	——	.78
R.M.P. No. 3*	lb.	——	.72
Brilliant Toning Reds*	lb.	1.65	1.90
Cadmolith Red* (dms.)	lb.	1.94	2.87
Cooke M.B. Red*	lb.	1.05	3.25
1010*	lb.	——	1.75
Disco Reds	lb.	1.05	3.25
Graphic Red* (dlvd.)	lb.	.93	.98
Kroma Reds*	lb.	.14	.15
Lake Red C*	lb.	——	1.20
Mapico Reds* (50 lb. bags)	lb.	.13¾	.14
Mercadium X-2668 Light*	lb.	——	1.68
X-2669 Medium Light*	lb.	——	1.76
X-2670 Medium*	lb.	——	1.83
X-2671 Dark*	lb.	——	1.91



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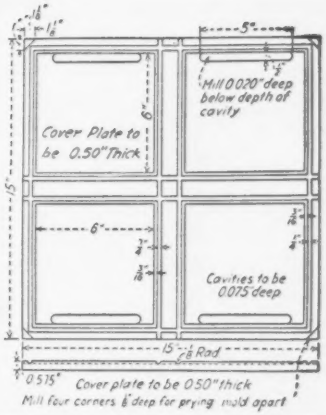
"DUMBELL" Test Strip Die D412(5IT)

For making tensile test samples, we make many types of slab molds. One is detailed at the right. These are plain or chrome finished. We usually stock molds for making adhesion, abrasion, flexing, compression and rebound test samples, but supply special molds promptly. We also furnish hand-forged tensile dies for cutting regular or tear test samples.

SLAB MOLD D15-4i


Mill 0.020" deep below depth of cavity
Cover Plate to be 0.50" Thick
Cavities to be 0.075 deep
0.515" Cover plate to be 0.50" thick
Mill four corners ⅛" deep for prying mold apart

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COLORING AGENTS (Cont'd)

Red (Cont'd)

Oximony Red Iron Oxide	lb.	.12¾	.13
Polaris Red*	lb.	—	1.65
Recco Red Oxide*	lb.	.12	.13
Red Iron Oxide, Light	lb.	.13¾	.14
Red Powders	lb.	—	4.40
Rubber Dispersed Reds	lb.	1.47	3.58
Rubber Red PBD* (Disp.)	lb.	—	2.05
2BD, Dispersed*	lb.	—	2.00
2BL*	lb.	1.24	1.24
PBL*	lb.	1.24	1.24
Rubanox Reds*	lb.	1.40	1.50
Rubber Red CP-339* (dlvd.)	lb.	—	1.10
Rubber Red X-1148*	lb.	—	.93
Solfast Red*	lb.	1.40	1.50
Stan-Tone MBS*	lb.	1.20	3.53
GPE*	lb.	1.65	2.00
PC*	lb.	1.30	2.50
PDS*	lb.	1.40	1.55
PVC*	lb.	1.65	1.90
Vansul Red M.B.*	lb.	1.00	3.35
Watchung Red*	lb.	1.90	1.90

Tan

Mapico Tan 15* (50 lb. bags)	lb.	.22¾	.2300
20* (50 lb. bags)	lb.	.22¾	.2300

White—Lithopone

Eagle-Picher*	lb.	.0800	.0975
Permolith*	lb.	.08375	.09125
Sunolith*	lb.	.0800	.0875

White—Titanium Pigments

Horse Head Anatase Grades*	lb.	.25½	.26½
Rutile Grades*	lb.	.25½	.26½
Stan-Tone PC*	lb.	—	.55
Ti-Cal*	lb.	.09	.09¾
R-22*, R-25*, R-27*, R-30*	lb.	.09⅜	.09⅞
R-60*	lb.	.09⅜	.10⅛
Ti-Pure*	lb.	.24½	.27½
Anatase Grades*	lb.	.25½	.26½
R-100*, R-500*	lb.	.27½	.28½
Titanox A*—all grades (dlvd.)	lb.	.24½	.25½
C-50* (dlvd.)	lb.	.13⅞	.14⅜
RA* (dlvd.)	lb.	.26½	.27½
RA-10* (dlvd.)	lb.	.26½	.27½
RA-NC* (dlvd.)	lb.	.26½	.27½
RC* (dlvd.)	lb.	.09¾	.09¾
RC-HT* (dlvd.)	lb.	.09	.09½
Unitane O-110*	lb.	.25½	.26½
O-220*	lb.	.25½	.26½
O-310*	lb.	.25½	.26½
O-410*	lb.	.25½	.26½
OR-150*	lb.	.27½	.28½
OR-250*	lb.	.27½	.28½
OR-340*	lb.	.27½	.28½
OR-342*	lb.	.27½	.28½
OR-350*	lb.	.27½	.28½
OR-540*	lb.	.27½	.28½
OR-640*	lb.	.27½	.28½
Zopaque*	lb.	.24½	.25½
R*	lb.	.26½	.27½

White—Zinc Oxide (American Process)

AZO-DOX 44, 45	lb.	.1450	.1550
AZO-ZZZ 11* (22*, 33*, 44*, 55*)	lb.	.1450	.1550
Eagle-Picher AAA*	lb.	1450	.1550
Horse Head Special*	lb.	.1450	.1550
XX*	lb.	.1450	.1550
Protox 166*	lb.	.1450	.1550
167*	lb.	.1450	.1550
168*	lb.	.1450	.1550
169*	lb.	.1450	.1550
267* (pelleted)	lb.	.1450	.1550
St. Joe Black Label*	lb.	.1450	.1550
Green Label*	lb.	.1450	.1550
Red Label*	lb.	.1450	.1550
Pelleted	lb.	.1450	.1550

White—Zinc Oxide (Dispersed)

Dispersed Zinc Oxide	lb.	—	.13

White—Zinc Oxide (French Process)

AZO-ZZZ 66	lb.	.1450	.1550
Florence Green Seal*	lb.	.1625	.1725
Red Seal*	lb.	.1575	.1675
White Seal*	lb.	.1675	.1775
Kadox 25*	lb.	.1675	.1775
15*, 17*, 72* & 515	lb.	.1450	.1550
Protox 168*	lb.	.1450	.1550
169*	lb.	.1450	.1550
268* (pelleted)	lb.	.1450	.1550
U.S.P. (cartons)	lb.	.1775	.1875
XX-78*	lb.	.1450	.1550

White—Zinc Sulfide

Cryptone ZS*	lb.	.2530	.2630
Lehigh 35%*	lb.	.1550	.1650
50%*	lb.	.1585	.1685

COLORING AGENTS (Cont'd)

Yellow

Akron Masterbatch*	lb.	1.12	2.18
Toners*	lb.	2.10	6.00
Benzidene-Lightfast	lb.	3.25	5.10
Benzidine Yellow	lb.	1.41	2.55
Cadmolith Yellow (dms.)	lb.	1.12	1.20
Chrome Yellow	lb.	.35	.35
Cooke M.B. Yellow 405*	lb.	2.15	2.75
105*	lb.	—	2.15
Disco Yellows	lb.	2.05	3.95
Iron Oxide, Pure			
Light Shades	lb.	.12	.12¼
Dark Shades	lb.	.11½	.11¾
Mapico Yellow* (50 lb. bags)		.12	.12¼
Rubber Dispersed Yellows	lb.	1.27	2.13
Rubber Yellow GD* (disp.)	lb.	—	2.25
GL*	lb.	—	1.68
Rubber Yellow X-1940*	lb.	—	2.35
Stan-Tone Cadmium Dry*	lb.	2.80	3.03
Cadmium Paste*	lb.	1.63	1.99
MBS*	lb.	1.30	2.20
GPE*	lb.	4.25	4.50
PC*	lb.	.55	3.40
Toluidine Yellow	lb.	2.20	2.20
YL-660 D*	lb.	1.25	1.35
Oximony Iron Oxide	lb.	.12¾	.13
Vansul Yellow M.B.*	lb.	1.00	2.00
Yellow Powders	lb.	2.00	5.00
Zinc Yellow	lb.	.29	.29

DISPERSING AGENTS

Anchoid*(†)	lb.	.24	.25
Anhydrapent*	lb.	.56	.59
Armeen 18*	lb.	.39	.45
Blancol*	lb.	—	.15¾
Darvan No. 1*, No. 2*, No. 3*	lb.	.22	.30
Daxad 11* (21*, 23*)	lb.	.08	.30
Diethanolamine (dms., dlvd.)	lb.	.24½	.27½
Dispersaid*	lb.	1.25	1.35
Emcol K-8300* (dms.)	lb.	.14	.18
P10-59	lb.	.32	—
5120	lb.	.31	—
5138	lb.	.31	—
Emulphor ON-870*	lb.	—	.55
Furala*	lb.	.06½	.07½
Halloid*	lb.	.04½	.05½
Hycryl A-1000*	lb.	.09	.09½
Igepal CO-630*	lb.	—	.29
Igepon T-73*	lb.	—	.29½
Kyro EO* (dms.)	lb.	—	.29¾
Leonil SA*	lb.	—	.55
Lomar PW*	lb.	—	.18
Marasperse C*	lb.	.06¼	.06¾
CB*	lb.	.13	.15
N*	lb.	.09½	.10½
Monoethanolamine (dms., dlvd.)	lb.	.25	.28
Naccotan A*	lb.	.16½	.17
Nekal BA-75*	lb.	—	.40
BX-78*	lb.	—	.64
Nopco 1187-X*	lb.	.15	.16
Pluronic F68*	lb.	.38½	.44
Polyfon*	lb.	.08	.09
R & R 551*	lb.	—	.28
Rubbex*	lb.	.247	.277
Stablex B*	lb.	.50	.95
Stan-Chem BQC*	lb.	.12¼	.17¼
1067*	lb.	—	.13½
1471*	lb.	.1687	.2187
2251*	lb.	.12¼	.17¼
Trenamine D-25*	lb.	.32½	.36
Triethanolamine (dms., dlvd.)	lb.	.22	.25
Yelkin TT* (and TTS*)	lb.	.13	.16

EXTENDERS

Arcco 1071-13B*	lb.	.14½	.15½
1073-18B*	lb.	.13½	.14½
1294-36B*	lb.	.11½	.12½
Car-Bel-Ex-A* (and B*)	lb.	—	.14
Extender 600*	lb.	—	.1765
Facile Gum 4A*	lb.	.48	.50
Millex*	lb.	—	.07
W*	lb.	—	.07
Nopco 2271*	lb.	.15½	.16½
Polyco 418*	lb.	.17	.18
PR-162 Latex Extender*	lb.	—	.182
Solvitose HDF*	lb.	.22	.25
Synprolac*	lb.	.16	.23
Synprowax*	lb.	—	.23
Vistanex MM Grades*	lb.	—	.35

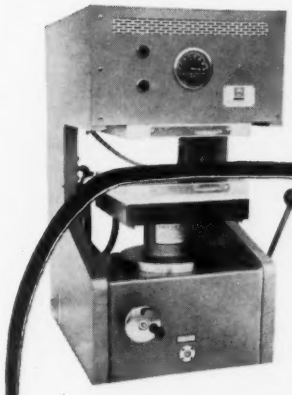
FILLERS (Inert and Reinforcing)

Abrasives			
Carbonite*	lb.	.21½	1.35
Lionite*	lb.	.16	1.27
Pumice	lb.	.03	.05
Walnut Shell Grits	lb.	.05	.08
Aluminum Hydrate	lb.	.0850	.1200
Kaiser Alumina*	lb.	.026	.059
Aluminum Silicate			
AFD*	ton	29.50	36.00
Aluminum Flake*	ton	29.50	36.00
Marter White*	ton	18.50	30.00
Barium Carbonate (l.c.l.)	ton	101.50	121.50

FILLERS (Cont'd)

Barytes			
No. 1 Floated, White*	ton	45.00	65.10
No. 2 Floated, Unbleached*	ton	43.00	63.10
No. 22 Barytes* (c.l.)	ton	—	30.00
No. 3805 Barytes*	ton	22.00	26.75
Foam A*	ton	—	55.00
Sparmite*	ton	80.00	85.00
X10R*	ton	80.00	85.00
Bentonite (c.l.)	ton	—	13.50
Argosite Clay* (c.l.)	ton	—	12.50
Bennett Clay* (c.l.)	ton	—	32.50
SPV Volclay* (c.l.)	ton	—	12.50
White Hi-Gel*	ton	—	65.90
Blanc Fixe	ton	125.00	142.00
Calcium Carbonate			
Atomite* (c.l.)	ton	—	32.50
B.I. White No. 1 (c.l.)	ton	—	9.00
Calcene NC*	ton	80.00	100.00
TM*	ton	82.50	102.50
Calwhite*	ton	—	20.00
Camel-Carb*	ton	—	12.00
Camel-Tex*	ton	—	20.00
Camel-Wite*	ton	—	32.50
Duramite*	ton	—	20.00
Gamaco* (c.l.)	ton	—	32.50
Georgia Marble 5-25* (c.l.)	ton	—	20.00
No. 10 White* (c.l.)	ton	—	11.00
Kalite*	ton	52.50	67.50
Laminar*	ton	—	30.00
Lesamite* (c.l.)	ton	—	27.50
Lorite*	ton	30.00	36.00
Millical*	ton	38.00	53.00
Multifex MM*	ton	117.50	137.50
Non-Fer-Al*	ton	35.00	50.00
Purecal M*	ton	56.75	80.75
SC* (and T*)	ton	110.00	125.00
U*	ton	120.00	135.00
Rambo No. 1*	ton	—	10.50
Snowflake*	ton	17.00	20.00
Super Multifex*	ton	167.50	187.50
Surfex*	ton	42.00	57.00
Suspenso*	ton	38.00	43.00
Witcarb Reg.*	ton	56.75	85.00
P*	ton	110.00	140.00
R*	ton	120.00	150.00
RC*	ton	110.00	140.00
York White*	ton	—	10.50
Calcium Silicate			
Silene EF*	lb.	.06	.07
Calcium Sulfate, Anhydrous			
Snow White Filler*	ton	—	21.00
Calcium Sulfate Hydrous			
Terra Alba No. 1*	ton	—	17.00
Chalk Whiting (l.c.l.)	lb.	.01½	.01¾
Recco Paris Whiting*	ton	—	35.00
OMYA Whiting*	ton	—	30.00
Clay			
Afton Clay*	ton	12.00	35.50
Aiken Clay*	ton	14.50	—
Alsilite* (c.l.)	ton	30.00	45.00
Aluminum Flake*	ton	25.50	28.50
Buca* (c.l.)	ton	—	45.00
Burgess No. 20*	ton	—	35.00
No. 30*	ton	—	37.00
Burgess Iceberg*	ton	—	50.00
Catalpo* (c.l.)	ton	—	35.00
Champion*	ton	—	14.50
Crown*	ton	—	14.00
Dixie* (c.l.)	ton	—	14.50
Franklin Clay—R* (c.l.)	ton	15.00	39.00
G. K. Soft*	ton	11.00	28.00
Harwick Clays*	ton	14.50	57.00
Hi-White R*	ton	19.50	—
Kaolloid Clay* (c.l.)	ton	—	10.50
LGB*	ton	17.50	22.50
LGP*	ton	20.00	25.00
McNamee* (c.l.)	ton	—	14.50
Natka 1200 (c.l.)	ton	—	13.00
Par* (c.l.)	ton	—	13.00
Paragon*	ton	14.50	19.50
Pigment 5*	ton	27.50	34.50
33*	ton	—	37.00
Recco* (c.l.)	ton	—	14.00
Swanee Clay*	ton	—	12.50
Snobrite*	ton	—	12.50
Suprex*	ton	14.50	19.50
Whitetex* (c.l.)	ton	—	50.00
4200 Clay*	ton	13.00	—
Diatomaceous Earth	ton	30.00	50.00
Kaylorite* (c.l.)	ton	—	30.00
Lorite*	ton	—	36.00
Flock			
Cotton (White)	lb.	.28	.32
Colored	lb.	.11	.13½
Filfloc F 40-9000*	lb.	—	.13
F 6000*	lb.	—	.36
Polycel*	ton	110.00	210.00
Rayon, Bleached or Dyed	lb.	.75	1.20
Rayon, Grey	lb.	—	.18
Rayon, Pink	lb.	—	.20
Solka-Floc* (l.c.l.)	lb.	.07	.16
Glue, Amber	lb.	.17	.19
Ground Softwood Bark			
Silvacon* (c.l.)	ton	55.00	100.00
Leather			
Flour (dust)	lb.	.12	.15
Shredded	lb.	.05	.17
Lignin	lb.	.06	.08
Indulin*	lb.	.06	.08

MAXIMUM ACCESSIBILITY



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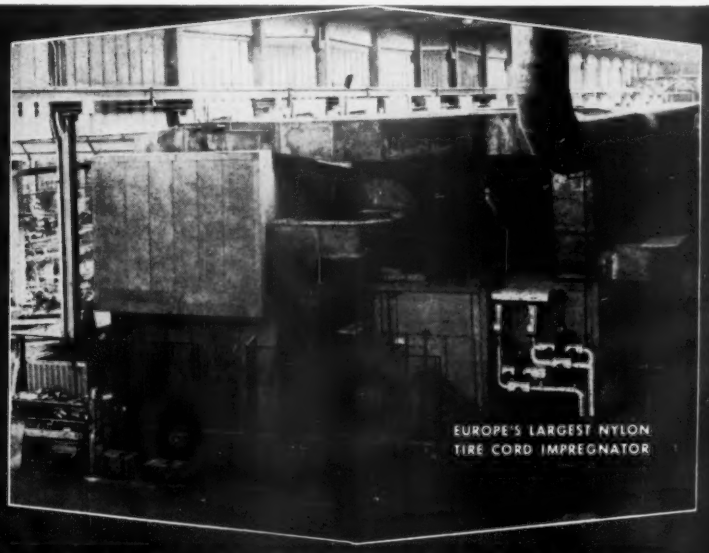

EUROPE'S LARGEST NYLON TIRE CORD IMPREGNATOR

CONTINUOUS IMPREGNATING & COATING SYSTEMS

. . . WORLD-WIDE SERVICE . . .

TECHNICAL DATA ON REQUEST: VARNISH, LATICE & RUBBER IMPREGNATION OF FABRICS & PAPERS

C. A. LITZLER CO., INC.

1817 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"

EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.

FILLERS (Cont'd)

Limestone, Pulverized	ton	3.00	5.00
Asbestol Regular*	ton	27.00	29.00
Asbestol Superfine*	ton	32.00	34.00
Georgia Marble No. 10*	ton	—	11.00
Industrial Filler No. 100*	ton	—	5.75
Micro Velva A*	ton	49.00	51.00
L*	ton	57.00	59.00
No. 1 White*	ton	—	10.00
Magnesium Carbonate	lb.	.12½	.15
K & M Clearcarb*	lb.	—	.14
Technical* (c.l., eqld.)	lb.	.10½	.12
Marinco CL*	lb.	—	.17
Magnesium Silicate (see Talc)			
Mica	lb.	.01¼	.07¼
Concord*	lb.	.08	.08¾
Micro-Mica*	lb.	.08	.08¾
Mineralite* (c.l.)	ton	40.00	85.00
Silversheen*	lb.	.08	.08¾
Triple A Mica* (c.l.)	ton	—	30.00
Vermiculite*	lb.	—	.11
Wet Ground Biotite Mica	lb.	.06½	.07¼
Wet Ground Mica No. 160*	lb.	.08	.08¾
Pecan Shell Flour Stan Shell*	ton	45.00	75.00
Pyrophyllite			
No. 261*	ton	—	11.50
Pyrax A* (c.l.)	ton	14.50	15.00
WA* (c.l.)	ton	17.00	17.50
Sawdust, Graded	ton	14.00	35.00
Silica	ton	16.00	27.00
Extra Fine (bags) (c.l.)	ton	—	43.00
Slate, Powdered (l.c.l.)	ton	15.00	20.00
Lo-Micron Slate Flour*	lb.	—	.04½
No. 133 Slate Flour*	ton	—	4.55
Sodium Silico Aluminate Zeolex 23*	lb.	.06	.07
Talc (Magnesium Silicate)			
Asbestol Regular*	ton	—	27.00
Eastern RC-500*	ton	—	32.00
No. 41*	ton	—	19.70
No. 549*	ton	—	63.00
French*	ton	—	59.00
L.S. Silver*	ton	33.75	38.75
No. 367*	ton	—	13.00
No. 1600*	ton	—	70.60
No. 1768*	ton	—	13.00
Nytal 200* (c.l.)	ton	—	28.00
300* (c.l.)	ton	—	38.00
Sierra Fibrene C-400*	ton	33.00	38.00
Supreme 325*	ton	46.25	57.25
Sierra White*	ton	20.75	31.75
Soapstone*	ton	—	13.00
Walnut Shell Flour	ton	55.00	100.00
Stan-Shell*	ton	50.00	84.00
Whiting, Commercial	ton	—	7.50
Allied Whiting*	ton	10.50	21.50
Camel-Carb*	ton	—	10.00
Calwhite (c.l.)	ton	—	20.00
C-C-O White*	ton	—	22.00
Georgia Marble No. 15*	ton	—	20.00
No. 16*	ton	—	20.00
Piqua No. 1 YAA* (c.l.)	ton	1.00	10.00
No. 2 LS* (c.l.)	ton	1.00	10.00
Snowflake* (c.l.)	ton	—	20.00
Stan-White 325*	ton	11.50	14.10
Veroc* (c.l.)	ton	—	10.50
Welco* (c.l.)	ton	—	10.50
York White R* (c.l.)	ton	—	10.00
Wood Flour	ton	31.50	48.00

FINISHING MATERIALS, SURFACE

Beaco Finishes*	gal.	2.10	2.35
Black Out*	gal.	4.50	8.00
Shellac, Orange Gum	lb.	.50	.60
VanWax*	ga.	1.45	1.50

FLAME RETARDANTS

Cellulex CEF* (dms.)	lb.	—	.65
Chlorowax 40*	lb.	.15¼	.17¼
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
Halowax*	lb.	.36	.46
Zinc Borate 3167*	lb.	.1920	.2020
Zyrox Compounds*	lb.	.38	.95½

LATEX MODIFIERS

Ludox	lb.	.15	.16¾
OPD-101*	lb.	—	.28
Piccopale A-1 Emulsion	lb.	.086	.107
Ubatol U-2001* (dms.)	gal.	1.84	1.87

LUBRICANTS, MOLD

Akro Gel*	lb.	—	.165
Alipal CO-433*	lb.	—	.20
CO-436*	lb.	—	.24
Aluminum Stearate Crown Brand*	lb.	.37	.42
Amine, Mixed Crude*	lb.	.19	.25
Aquadag*	lb.	3.50	4.00
Aquarex D*	lb.	—	.78
L*	lb.	—	.94
ME*	lb.	—	.80
MDL*	lb.	—	.33
WAQ*	lb.	—	.22

LUBRICANTS, MOLD (Cont'd)

Armeen HT*	lb.	.34	.40
180*	lb.	.52	.56
Armid HT (flaked)*	lb.	.42	.46
O*	lb.	.39	.41
Borax, Granular (l.c.l.)	ton	89.00	94.00
Carbowax 4000*	lb.	.31	.32
CD Mold Release B*	gal.	5.00	—
B-2*	gal.	5.00	—
Colite Concentrate* (dms.)	gal.	.90	1.15
Colite D43D*	gal.	1.15	1.40
Concentrex*	lb.	—	.25
Dag Dispersions No. 197*	lb.	1.85	2.90
D.C. 7 Compound*	lb.	5.13	6.50
D.C. Emulsion No. 7*	lb.	1.59	2.07
No. 8*	lb.	1.22	1.76
No. 35*	lb.	1.22	1.76
No. 35A*	lb.	1.22	1.76
No. 35B*	lb.	1.22	1.76
No. 36*	lb.	1.22	1.76
D.C. Mold Release Fluid*	lb.	3.14	4.75
Dri-Lube*	lb.	—	.22
Emulsion Lubricant A80*	lb.	—	1.80
45*	lb.	—	1.80
G-E Silicone Emulsion SM-55*	lb.	1.22	1.76
SM-61*	lb.	1.22	1.76
SM-62*	lb.	1.22	1.76
G-E Silicone Fluid SF-93*	lb.	3.14	4.25
SF-96*	lb.	3.14	4.25
Glydag G*	lb.	1.30	2.45
Hawkeye Flake* (dlvd.)	lb.	.15	.15¼
HSC No. 35*	lb.	1.22	2.46
No. 515	lb.	1.22	2.46
Igepal CO-430*	lb.	—	.29
CO-630*	lb.	—	.29
CO-530*	lb.	—	.29
Igepon AP-78*	lb.	—	.48
T-33*	lb.	—	.21
T-51*	lb.	—	.13½
Kokoboce R*	lb.	.17½	.18½
Lubrex	lb.	.25	.30
Lubri-Flo*	gal.	10.00	12.00
Migralube*	lb.	—	.35
ML-1027-2C*	gal.	—	2.15
ML-1028-2C*	gal.	—	2.15
Mold Lubricant No. 72 Conc.* (dms.)	gal.	—	1.90
Mold Lubricant No. 735* (dms.)	gal.	—	1.25
No. 769* (dms.)	gal.	—	1.20
No. 825* (dms.)	gal.	—	2.00
No. 856* (dms.)	gal.	—	1.90
No. 880* (dms.)	gal.	—	1.19
No. 887* (dms.)	gal.	—	1.80
No. 896* (dms.)	gal.	—	1.28
No. 935* (dms.)	gal.	—	1.56
No. 956* (dms.)	gal.	—	2.50
No. 965* (dms.)	gal.	—	2.15
No. 967* (dms.)	gal.	—	2.40
No. 969* (dms.)	gal.	—	1.50
No. 975* (dms.)	gal.	—	2.85
No. 980* (dms.)	gal.	—	1.53
No. 987* (dms.)	gal.	—	2.45
Moldeze No. 3*	gal.	—	4.95
Mold-Brite*	gal.	—	1.50
Monopole Oil MD*	lb.	—	.16
Olate Flakes*	lb.	.22	.23
Orvus WA Paste* (dms.)	lb.	—	.22
Plaskon Polyethylene S*	lb.	.32	.47
Poly-Brite PE-20	lb.	.28	.42
600	lb.	.42	.58
Poly-Cone 125X	lb.	1.20	1.40
1,000	lb.	.93	1.06
Polyglycol 15-200*	lb.	.25	.28¾
E4000*	lb.	.31	.37
Prodag*	lb.	.28	.42
Purity Flake* (dlvd.)	lb.	.18	.19¾
Rubber-Flo*	gal.	1.25	2.00
Rubber-Glo*	gal.	—	.94
Rusco Mold Paste*	lb.	—	.25
Sericite* (l.c.l.)	ton	65.00	75.00
Silicone Oil A145*	lb.	3.18	3.61
Silrex (dms.)	lb.	—	.65
A65*	lb.	2.50	2.75
Soybean Lecithin	lb.	.13	.17
Thermalube*	lb.	—	.13¾
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-45*	lb.	1.22	1.70
LE-450*	lb.	1.22	1.70
Ucon Lubricants*	lb.	.26¼	.27¾
Ulco Mold Soap*	lb.	.15	.29

LUBRICANTS, RUBBER

Diglycol Stearate Neutral (and SE) (dms.)	lb.	—	.25
Extrud-o-Lube*	gal.	1.33	1.54
G.B. Naphthenic Neutrals*	gal.	.11	.18
Ivory Chips*	lb.	.18¼	.19¾
Latex-Lube GR* (dlvd.)	lb.	.19¼	.20
No. 82-A* (450 lb. dms.)	lb.	—	.08½
Propylene Stearate (dms.)	lb.	.35	.60

LUBRICANTS, RUBBER SURFACE

Barium Stearate	lb.	.41	.46
Calcium Stearate	lb.	.39	.44
Crown Brand*	lb.	.37	.42
D.C. 7 Compound*	lb.	5.13	6.50
D.C. 200 Fluid*	lb.	3.14	4.75

LUBRICANTS, RUBBER SURFACE (Cont'd)

ELA*	lb.	—	.82
G-E Silicone Fluid SF-92*	lb.	3.14	4.25
Glycerized Lubricant*	gal.	1.25	1.48
Glydag B*	lb.	1.50	2.10
G*	lb.	1.30	2.45
Glyso-Lube* (dms.)	lb.	—	.14
No. 3* (dms.)	lb.	—	.14
HSC No. 35*	lb.	1.28	1.34
No. 515*	lb.	1.28	1.34
Hydro-Zinc*	lb.	—	.20
Latex-Lube Pigmented* (dlvd.)	lb.	.17¼	.18¼
R-66*	lb.	—	.16½
Liqui-Lube* (dlvd.)	lb.	—	.16¾
N.F.* (dlvd.)	lb.	—	.16¾
N.T.* (dlvd.)	lb.	—	.16¾
Lubrex*	lb.	.25	.30
Lubri-Cote	gal.	.86	1.00
Magnesium Stearate	lb.	.42	.47
Crown Brand*	lb.	.40	.45
Polyethylene Glycol	lb.	.22	.26
Rubber Free (Concentrate)*	gal.	—	1.44
Jel*	lb.	.18	.21½
Slab-Dip* (dms.)	lb.	—	.15
Soybean Lecithin	lb.	.13	.17
Stock-Lube*	lb.	—	.19
UC Silicone L-45*	lb.	3.14	4.75
L-522*	lb.	3.05	4.05
LE-450*	lb.	1.22	1.70
Zinc Stearate	lb.	.41	.46

MOLD CLEANERS

Actusol* (dlvd.)	gal.	1.45	1.65
Alkon* (dlvd.)	lb.	.16	.16½
CA-301*	gal.	—	2.49
CA-302*	gal.	—	2.63
G-O 6910*	lb.	.38	.40
Metso Anhydrous*	cwt.	5.70	7.95
Metso 99*	cwt.	5.00	7.25
200*	cwt.	6.70	8.95
Granular*	cwt.	4.45	6.70
Orvus Extra Granules*	lb.	.22½	.23½
Rubber-Sol*	gal.	2.97	3.97
Sprex A.C.* (dlvd.)	lb.	.17¾	.18¾
Zip Mold Cleaner*	gal.	.95	1.45

PEPTIZING AGENTS

Peptizer P-12*	lb.	.95	1.25
Pepton 22 Plasticizer*	lb.	.83	.86
65*	lb.	1.23	1.26
65B*	lb.	.83	.86
Pitt-Consol 620, 640	lb.	.37	.42
RPA 2*	lb.	—	.85
3*	lb.	—	.51
3 Conc.*	lb.	—	.85
5*	lb.	—	.68
6*	lb.	—	1.66

PLASTICIZERS & SOFTENERS

Acto 500*	lb.	—	.09
Adipol BCA*	lb.	.45	.45½
2EH*	lb.	.42½	.43½
10A*	lb.	.42½	.43½
ODY*	lb.	.45½	.46½
810*	lb.	.42½	.45¼
XX*	lb.	.42½	.43½
Admex 562 (dms.)	lb.	.50¼	.51¼
710 (dms.)	lb.	.35¼	.36¼
711 (dms.)	lb.	.37¼	.38¼
744 & 745 (dms.)	lb.	.41¼	.42¼
760 (dms.)	lb.	.59¼	.60¼
761 (dms.)	lb.	.46¼	.47¼
Anhydrol 6990*	lb.	.51	.56
Arneel SD*	lb.	.34	.40
Arolene 1980* (c.l.)	lb.	—	.10
Aromatic Plasticizer 10* (and 25*) (dms.)	lb.	.05	.06½
Aromatic Tar	gal.	.0573	.1973
Bardol*	lb.	.02¾	.03¾
B*	lb.	.06¼	.06½
Bayol D*	gal.	—	.382
F*	gal.	—	.52
Beeswax, Bleached	lb.	.76	.79
Yellow Refined	lb.	.68	.70
Bondogen*	lb.	.55½	.60½
B.R.C. No. 20*	lb.	.0150	.0175
No. 21*	lb.	.02¾	.03
No. 22*	lb.	.02½	.02¾
B.R.H. 2*	lb.	.0213	.0351
BRS 700*	lb.	.0200	.0285
B.K.T. 3*	lb.	.0180	.0265
4*	lb.	.0250	.0260
7*	lb.	.0300	.0310
B.R.V.*	lb.	.0475	.0565
Bunarex Resins*	lb.	.07	.08
Bunatak AH*	lb.	—	.09½
N*	lb.	—	.31
U*	lb.	—	.17½
No. 90*	lb.	—	.09
No. 210*	lb.	—	.14
Butac*	lb.	.12½	.13½
Butyl Carbitol Perlargonate (dms.)	lb.	—	.64½
Butyl Cellosolve Perlargonate (dms.)	lb.	—	.68
Butyl Oleate	lb.	.25½	.26½
Butyl Palmitate	lb.	—	.26½
Butyl Stearate (dms.)	lb.	.27¼	.27¾

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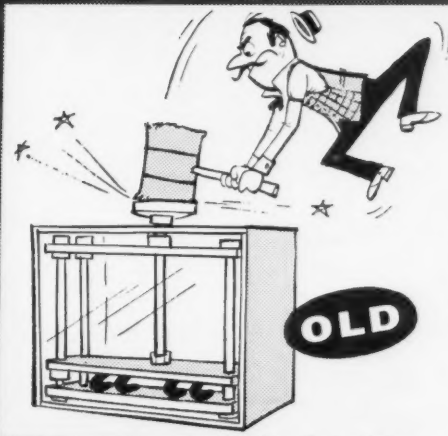

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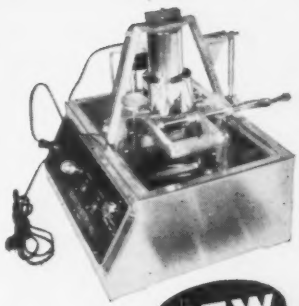

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PLASTICIZERS & SOFTENERS (Cont'd)

Califlux 510* (and 550*)	lb.	.03½	.03¾
G.P.*	lb.	.02¼	.02½
R-100*	lb.	.05½	.05¾
TT*	lb.	.0270	.0295
Candelilla Wax, Prime	lb.	.70	.74
Refined Light	lb.	.73	.78
Carbowax 4000* (dms.)	**lb.**	**.31**	**.32**
Cardolite NC-103*	lb.	.56	.59
Carnauba Wax, Crude	lb.	.71	.77
Flaked	lb.	.72	1.55
Refined, Technical	lb.	.72	.80
Refined, Pure	lb.	.80	.86
Yellow	lb.	1.42	1.45
Celluflex* (dms.)			
112* (t.c., dlvd.)	lb.	——	.34½
179-A* (t.c., dlvd.)	lb.	——	.32½
179-C* (t.c., dlvd.)	lb.	——	.32½
179-EG* (t.c., dlvd.)	lb.	——	.32½
DBP* (t.c., dlvd.)	**lb.**	**——**	**.30**
DOP* (t.c., dlvd.)	lb.	——	.28½
TPP* (dms., eqld.)	**lb.**	**——**	**.40**
Ceresin Wax	lb.	.12	.30
Chlorowax 40*	**lb.**	**.15¼**	**.17¼**
50*	lb.	.16¾	.17¾
70*	lb.	.18½	.20
LV*	lb.	.17¼	.19¼
CTLA Polymer*	**gal.**	**.20**	**.36**
Cumar Resins*	lb.	.07	.19
Darex DBP*	lb.	.30	.33
DOP*	lb.	.30½	.33½
DIOP*	lb.	.30½	.33½
D.B.M.*	lb.	.32	.34¾
Decylbutyl Phthalate	lb.	.27	.29½
Degras, Common	**lb.**	**——**	**.14**
Diallyl Phthalate	**lb.**	**.51½**	**.52½**
Dibenzyl Sebacate (dms.)	lb.	.93	.92½
Dibutoxyethyl Sebacate	**lb.**	**——**	**.56¾**
Dibutyl Phthalate	lb.	.32½	.33½
Dibutyl Sebacate	lb.	.67½	.68
Dicapryl Adipate	**lb.**	**.42**	**.44**
Dicapryl Phthalate	lb.	.29½	.31
Dicapryl Sebacate	**lb.**	**.58**	**.59½**
Di-CarbitolPhthalate(dms.)	lb.	.49	.49½
Dicyclohexyl Phthalate	**lb.**	**.58¼**	**.59¼**
Diethyl Phthalate	lb.	.31½	.32½
Di-2-ethylhexyl Phthalate	**lb.**	**——**	**.30½**
Dihexyl Adipate	lb.	.46½	.47½
Dihexyl Phthalate	**lb.**	**.30**	**.32½**
Dihexyl Sebacate (dms.)	lb.	.66	.66½
Diisobutyl Azelate	**lb.**	**——**	**.47¾**
Di-iso-octyl Adipate	lb.	.42½	.43½
Di-iso-octyl Phthalate	lb.	.30½	.31½
Dimethyl Phthalate	lb.	.32	.33
Dimethyl Sebacate (dms.)	lb.	1.30	1.30½
Dinonyl Adipate	**lb.**	**.44½**	**.47½**
Dinopol 235*	lb.	.36	.37
IDO*	lb.	.31	.32
MOP*	lb.	.31½	.32½
Dioctyl Adipate	lb.	.42½	.43½
Dioctyl Phthalate (dms.)	lb.	.30½	.31½
Dioctyl Sebacate (dms.)	lb.	.61¼	.61¾
D.I.O.P. (dms.)	**lb.**	**.31**	**.32**
Dipolymer Oil	**gal.**	**.33**	**.48**
Dispersing Oil No. 10*	**lb.**	**.06**	**.06¼**
Dutrex 6*	**gal.**	**——**	**.11**
15E*	**gal.**	**——**	**.10**
Elastex 10-P*	**lb.**	**.30½**	**.33½**
50-B*	**lb.**	**.25**	**.28**
DCHP*	**lb.**	**.59**	**.60**
Emulphor EL-719*	lb.	——	.58
Epoxy Plasticizer	**lb.**	**.33½**	**.36**
Drapex 3.2*	lb.	.39¼	.44
Drapex 4.4*	lb.	.37	.42
Esparto Wax	lb.	——	.55
Estac*	**lb.**	**——**	**.16**
Facile Gum 4A*	**lb.**	**.48**	**.50**
Flexol B-400*	**lb.**	**.27½**	**.28½**
DOP*	lb.	.33	.34
TOF*	lb.	.45½	.46½
3GH*	lb.	.46	.46¾
3GO*	lb.	.55	.55¾
4GO*	lb.	.35	.36
426*	lb.	.29½	.30½
Flexricin P-1*	lb.	——	.32
P-4*	lb.	——	.34¾
P-6*	lb.	——	.41½
P-8*	lb.	——	.34¾
Fortex A* (dms.)	**lb.**	**.12½**	**.14½**
Fura-Tone NC-1008*	lb.	.28	.39
Galex W-100*	**lb.**	**.15½**	**.16¼**
G.B. Asphaltic Flux*	gal.	.23	.25
G.B. Light Process Oil*	lb.	.0157	.0177
Medium Process Oil*	lb.	.03½	.03¾
G.B. Naphthenic Neutrals*	**lb.**	**.04½**	**.04¾**
Good-rite GP233*	lb.	.40	.43½
GP235*	lb.	.40	.43½
GP236*	lb.	.40	.43½
GP261*	lb.	.28	.31½
GP265*	lb.	.28½	.32
GP266*	lb.	.29	.32½
GP-266-BPA*	lb.	.29	.32½
Harflex 500* (dms.)	lb.	.34	.35
HB20*	lb.	.15	.17
HB40*	lb.	.19	.22
Herron-H.T.*	**gal.**	**.16**	**.27**
Herron-Plas*	**lb.**	**——**	**.03¾**
Herron-Wax*	**lb.**	**.05¼**	**.06**
No. 23*	**lb.**	**.08¼**	**.08¾**
No. 24*	**lb.**	**.07¼**	**.07¾**
HSC No. 13*	**lb.**	**.25**	**.32**
No. 28 and 38*	lb.	.20	.27
Indonex 632½* (633½*, 634½*, 637½*)	**gal.**	**.12**	**.19**

PLASTICIZERS & SOFTENERS (Cont'd)

Isooctyl Decyl Phthalate	lb.	.28½	.32
Kapsol*	**lb.**	**.35**	**.35½**
Kenflex*	**lb.**	**.18**	**.27**
Kessco flex 101* (dms.)	lb.	——	.37½
103* (dms.)	lb.	——	.38
MCO* (dms.)	lb.	——	.35½
BCL* (dms.)	lb.	——	.37½
MCP* (dms.)	lb.	——	.41
BCP* (dms.)	lb.	——	.36
Kl- 23*	**lb.**	**.31½**	**.32½**
90*	lb.	.42½	.43½
140*	lb.	.48	.48½
201*	lb.	.58	.59
220* & 260*	lb.	.35½	.36½
666*	lb.	.59½	.60
Kremol 40*	**gal.**	**.36**	**.46**
50*	gal.	.39	.49
Kromisol* (dms.)	lb.	.33	.36
Kronitex AA* (dms.)	**lb.**	**.35**	**.36**
I* (dms.) and K-3*	lb.	.35	.36
MX*	lb.	.35	.36
Lanolin, Tech. Anhydrous	lb.	.36	.20
Latex-Lube G.R.*	lb.	.19¼	.20
Lead Oleate	lb.	——	.29¾
Lindol* (dms., t.c.)	**lb.**	**——**	**.32½**
Locusol No. 1-6980*	lb.	.30	.34
2-Mercaptoethanol (dms.)	**lb.**	**1.25**	**1.50**
Methox*	**lb.**	**.40½**	**.41**
Methyl Laurate	**lb.**	**.25**	**.27**
Methyl Oleate	**lb.**	**——**	**.20**
Methyl Stearate (dms.)	**lb.**	**——**	**.30**
Monoplex DOS*	lb.	.59½	.60½
DBS*	lb.	.65½	.66½
S-70*	lb.	.41	.42
S-71*	lb.	.46½	.47½
Montan Wax, Crude	lb.	.26	.35
Flaked	lb.	.29	.40
Morflex*	**lb.**	**.32**	**.69½**
MR 2088* (dms.)	**lb.**	**——**	**.19**
Natac*	lb.	.12	.13
Nebony Resins* (dms.)	lb.	.04½	.05
Neolene 210* (t.c.)	**lb.**	**——**	**.16**
212* (t.c.)	**lb.**	**——**	**.14**
220* (t.c.)	**lb.**	**——**	**.15**
Nerium*	**lb.**	**——**	**.09**
Nevillac Resins* (dms.)	**lb.**	**.31**	**.85**
Neville LX-880* (dms.)	lb.	.12	.13½
LX-685* (dms.)	lb.	.12½	.17½
Neville Resins* (dms.)	lb.	.07¼	.20
Nevindene Resins* (dms.)	lb.	.16½	.20
Nevinol* (dms.)	lb.	——	.24
Nuba 1* (and 2*) (dms.)	lb.	.06¼	.06¾
No. 480 Oil Proof Resin*	**lb.**	**——**	**.18**
Ohopex Q10* (dms.)	lb.	.30½	.31½
R9* (dms.)	lb.	.37¼	.37¾
Ortho-Nitrobiphenyl	**lb.**	**.13**	**.15**
Ozokerite Wax, White and Yellow	lb.	.24	.31
Paradene Resins (dms.)	lb.	.07¼	.08
No. 2 Flaked	lb.	.08	.08½
Para Flux* (dms.)	gal.	.22	.25
2016* (dms.)	gal.	.22	.26
Para Lube* (l.c.l.)	lb.	.046	.048
Paraplex G-25*	lb.	.76	.77
G-40*	lb.	.50	.51
G-50*	lb.	.40¾	.41¾
G-53*	lb.	.45	.46
G-60* (and G-61*)	lb.	.35	.36
G-62*	lb.	.37	.38
Parmo*	**lb.**	**.06**	**.13½**
Pepton 22 Plasticizer*	lb.	.81	.84
PG-16*	**lb.**	**——**	**.35**
Philrich-5* (t.c.)	**gal.**	**——**	**.11**
Picco 10* (and 25*)	lb.	.15	.17
60* (and 75*)	lb.	.15	.17
100*	lb.	.15	.17
Piccocizer 30*	**lb.**	**.05½**	**.07**
Piccolastic A* (B*, C*, D* & E*)	**lb.**	**.24½**	**.25**
FT* (FHX* & FX*)	lb.	.1695	.1745
T-135*	**lb.**	**.22¾**	**.23¾**
Piccolyte S Resins*	lb.	.20½	.22¾
Piccopale Resins*	lb.	.12	.13
Piccoumaron Resins*	lb.	.07	.24½
Pigmentar*	lb.	.0460	.0634
Pigmentaroil*	lb.	.0460	.0634
Plastac M*	**lb.**	**——**	**.09¼**
Plasticizer 2286*	**lb.**	**——**	**.26¼**
Plasticizer 4141*	lb.	.42½	.43½
Plasticizer DP-200, DP-250, DP-520*	lb.	.42¼	.46¼
Plasticizer LP*	lb.	——	.07
Plasticizer MP*	lb.	——	.08
Plasticizer MT-511*	**lb.**	**——**	**.68¾**
Plasticizer ODN*	lb.	.35	.41
Plasticizer SC*	**lb.**	**.42½**	**.43½**
Plasticizer W-13*	**lb.**	**.37**	**.38¼**
Plastoflex 3*	**lb.**	**——**	**.52**
52*	lb.	.37¾	.38¾
VS*	**lb.**	**.41¾**	**.42¾**
Plastogen*	lb.	.08¾	.09
Plastolein 9050* (c.l.)	lb.	.54½	.56½
9055*	lb.	.30½	.32½
9058*	lb.	.48	.50
9250*	lb.	.38¼	.40¼
9715*	lb.	.39	.40
Plastone	lb.	.23	.27
Polycizer 162*	lb.	.28	.31½
332*	lb.	.40	.42½
562*	lb.	.28½	.32
662*	lb.	.29	.32½
532 and 632*	lb.	.40	.42½
ED*	**lb.**	**——**	**.51**
Polyco 438*	**lb.**	**.34**	**.35**
Polymel C-130*	lb.	.13¼	.14¾
D*	lb.	.22½	.23½
6*	**lb.**	**.05¼**	**.07¾**

PLASTICIZERS & SOFTENERS (Cont'd)

Poly-Sperse AP-2	lb.	.23	.29½
AP-300, LC-20	lb.	.26	.32½
Poly-Sperse R-100	lb.	.17	.23½
Process Oil C-255* (c.l.)	gal.	.27½	.29½
Propylene Stearate (dms.)	**lb.**	**——**	**.32**
PRR 1*	**gal.**	**.15**	**.35**
PT 101 Pine Tar Oil* (t.c., dms.)	gal.	.0380	.0554
400 Pine Tar* (600* & 800*) (t.c., dms.)	**lb.**	**.0380**	**.0554**
PX-104*	lb.	.30	.32½
PX-108*	lb.	.30½	.33
PX-138*	lb.	.32½	.33½
PX-208*	lb.	.44½	.45½
PX-238*	lb.	.44½	.45½
PX-404*	lb.	.66	.67
PX-438*	lb.	.60	.61
PX-800*	lb.	.34	.35
PX-917*	lb.	.36½	.37½
Reogen*	lb.	.14¼	.14½
465 Resin* (dms.)	lb.	.07½	.08
Resin C*	**lb.**	**.0225**	**.0310**
Resinex*	lb.	.03¼	.04¾
L-4*	lb.	.02¼	.03¼
Rexflex*	**lb.**	**——**	**.15**
Rosin Oil	gal.	.80	1.35
RR-10 (Neoprene)*	lb.	——	.37
R.S.O. Softening Oil*	**lb.**	**.03**	**.05**
RuBars*	lb.	.19¼	.20
Rubberol*	lb.	.18	.25¾
Santicizer B-16*	**lb.**	**.48¾**	**.49¾**
E-15*	lb.	.52¾	.53¾
M-17*	lb.	.44¾	.45¾
No. 140*	lb.	.32½	.36
No. 141*	lb.	.36	.37
No. 160*	lb.	.28½	.29½
No. 602*	lb.	——	.30½
No. 603*	lb.	——	.27
Sherolatum*	lb.	.03½	.06
Staflex DBES*	lb.	.58	.60½
DOS*	lb.	.58	.60½
1XA*	lb.	.32	.35
KA*	lb.	.36	.38¾
Stan Chlor Oils*	lb.	.13½	.20½
70*	lb.	.17½	.30
Stanolind Petrolatum*	lb.	.07	.156
Wax*	**lb.**	**.31**	**.33**
Sunny South Burgundy Pitch*	**lb.**	**.1030**	**.1085**
Rosin Oil*	gal.	.58	.76
Superla Wax*	lb.	.30	.397
Syncera Wax*	lb.	.16	.267
Syn Tac* (c.l.)	gal.	——	.33
Synthetic Revertant Oil	lb.	——	.16
Tar, Refined	**gal.**	**.1200**	**.1760**
Tarpine	lb.	.035	.050
Terpene A*	**gal.**	**——**	**.65**
Tetraflex R-122*	lb.	.27	.30½
TP-90B*	lb.	.59	.69
TP-95*	lb.	.65	.75
Transphalt Resins*	lb.	.03¾	.05½
Tributyl Phosphate	lb.	.52½	.53½
Tricresyl Phosphate	lb.	.32½	.36
Turgum S*	lb.	.10¾	.11¾
Turgum SB*	lb.	.07	.08
Turpol NC-1200*	lb.	.67	.70
NC-1300*	lb.	——	.50
Vanadiset B*	lb.	.036	.07
C*	lb.	.031	.06
MR 80 Mesh*	lb.	.08½	.12½
Vistac No. 1*	**gal.**	**1.00**	**1.21**
P*	**lb.**	**.18**	**.18½**
Vopcolene 50*	lb.	——	.31
Witcizer 100*	lb.	.20¼	.21¼
200*	lb.	.20¼	.21¼
201*	lb.	.22¾	.25¼
300*	lb.	.30	.33½
312*	lb.	.30½	.34
313*	lb.	.30½	.34
412*	lb.	.42½	.46
Witresin*	ton	——	52.50

PROCESSING AIDS

Castor Oil, Blown (dms.)	**lb.**	**——**	**.21**
Refined (dms.)	**lb.**	**——**	**.18½**
Castorwax*	**lb.**	**——**	**.24½**
Dutrex 7*	**lb.**	**.12**	**.20**
ELA*	**lb.**	**——**	**.82**
Hydrofol Glycerides 200*	lb.	.15½	.19¾
Kenflex N*	**lb.**	**——**	**.18**
Maleic Anhydride	lb.	——	.27
Millrex*	**lb.**	**——**	**.15**
Nadic Anhydride	lb.	——	.75
Polycin*	lb.	——	.24½
Resin No. 510*	lb.	.19	.26
No. 529*	lb.	.25	.32
Pulverized*	**lb.**	**.20½**	**.25**
Thiomalic Acid	lb.	——	3.50
Zyrox*	lb.	.78	.88

PROTECTIVE & STABILIZING AGENTS

Acacia*	**lb.**	**.12¼**	**.21**
Alcogum*	lb.	.08½	.24
Alpha Protein	**lb.**	**——**	**.23**
Aroostoocrat*	lb.	——	.07½
Carob Bean Flour	lb.	——	.50
Casein	lb.	.32	.38
Emcol K-8300* (dms.)	lb.	.14	.18
Ethylene Diamine 68%	**lb.**	**.44**	**.47**
Gum Arabic	lb.	——	.23
Karaya Gum	lb.	——	.35
Locust Bean Gum	lb.	——	.50
Prosein*	**lb.**	**——**	**.06**
Stablex B*	**lb.**	**.50**	**.95**
K*	**lb.**	**.27**	**.35**

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No. 12 Bolling Spiral-Flow Mixer with conventional drive for rubber or plastics.

Bolling builds 4 production sizes for a range of capacities: No. 3 (3400 cu. in.), No. 4 (5100 cu. in.), No. 10 (12160 cu. in.), No. 12 (16000 cu. in.). Also one production-laboratory model —No. 1B (1200 cu. in.). Also one laboratory model—No. 0 (275 cu. in.).

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Spiral-Flow Sides for the heating or cooling of stock, which give greater thermal efficiency . . . *Split End Frames* which permit rotor removal without completely dismantling ends of machine . . . *Anti-Friction Bearings* for optimum power, smoother running, and longer life. No end zone movement of rotors . . . Stewart Bolling production mixers offer other outstanding advantages for profitable operation; rotors with full circle end flanges; compound, dual or conventional geared drives, and other features.

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RECLAIMING AGENTS

Amalgamator Z-4*	lb.	.3[illegible]	.33
Armeen C*	lb.	.46	.52
Mixed Crude*	lb.	.19	.25
T*	lb.	.32	.38
Burco RA*	lb.	.05	.081
BWH-1*	gal.	.17	.18
C-6 Oil* (28° & 32°)	gal.	.33	.38
C-10 Oil*	gal.	.25	.30
C-33* (t.c.)	gal.	—	.21½
C-42* (t.c.)	gal.	—	.23
Caustic Soda—Flake 76% (c.l., dms.)	cwt.	—	4.50
Liquid 50% (t.c.)	cwt.	—	2.80
Solid 76% (c.l., dms.)	cwt.	—	4.10
Cresylic Acid (99-100%)	gal.	.85	1.39
D-4* (t.c.)	gal.	—	.27
E-5* (t.c.)	gal.	—	.25
Flake Calcium Chloride (77-80%)	ton	—	29.00
G.B. Reclaiming Oil*	gal.	.19½	.21½
CD-10*	gal.	.17½	.19½
CD-50-U*	gal.	.25½	.27½
Gensol No. 6* (t.c.)	gal.	—	.40
Heavy Aromatic Naphtha	gal.	.13¼	.18½
LX-77 Reclaiming Solvent*	gal.	.21	.33
LX-572 Reclaiming Oil*	gal.	.27	.32
LX-777 Reclaiming Oil*	gal.	.23	.33
Neo-Fat D-242*	lb.	.05½	.07¾
42-70*	lb.	.08¼	.10¾
No. 517 H.B. Oil*	gal.	.11½	.16½
535*	gal.	.22	.27
Pitt-Consol "500" (dms.)	lb.	.30	.30½
PT 101 Pine Tar Oil* (t.c., dms.)	gal.	.0380	.0554
Q Oil* (t.c.)	gal.	—	.28o
Reclaiming Oil 3186-G*	gal.	.26	.33
Reclaiming Reagent No. 1431*	lb.	.21	.25
R.P.A. No. 3*	lb.	—	.47
RR-10*	lb.	—	.37
Soda Ash (c.l., bags)	cwt.	—	1.75
Solvent 534*	gal.	.20½	.26½
Solvent Oil 21*	gal.	.24	.29
C-42*	gal.	.23	.38
X-1 Resinous Oil*	lb.	.0225	.0325
701 Oil*	gal.	.27	.29

REINFORCING AGENTS—CARBON BLACK

Channel, Hard Processing (HPC) (bags)

Atlantic HPC-98*	lb.	.0775	.1450
Continental F*	lb.	.0775	.1450
Croflex*	lb.	.0775	.1450
Dixiedensed (and S)*	lb.	.0775	.1450
Kosmobile (and S)*	lb.	.0775	.1450
Micronex HPC*	lb.	.0775	.1450
Witco No. 6*	lb.	.0775	.1450

Channel, Medium Processing (MPC) (bags)

Arrow MPC*	lb.	.0775	.1350
Atlantic MPC-95*	lb.	.0775	.1450
Continental A*	lb.	.0775	.1450
Croflex TH*	lb.	.0775	.1450
Dixiedensed HR (and S-66)	lb.	.0775	.1450
Kosmobile HM (and S-66)	lb.	.0775	.1450
Micronex Standard*	lb.	.0775	.1450
Spheron 6*	lb.	.0775	.1450
Texas M*	lb.	.0775	.1450
Witco No. 1*	lb.	.0775	.1450

Channel, Easy Processing (EPC) (bags)

Atlantic EPC E-42*	lb.	.0775	.1450
Collocarb*	lb.	.0590	.1400
Continental AA*	lb.	.0775	.1450
Croflex 77*	lb.	.0775	.1450
Dixiedensed 77*	lb.	.0775	.1450
Kosmobile 77*	lb.	.0775	.1450
Micronex W-6*	lb.	.0775	.1450
Spheron 9*	lb.	.0775	.1450
Texas E*	lb.	.0775	.1450
Witco No. 12*	lb.	.0775	.1450
Wyex EPC*	lb.	.0775	.1350

Channel, Conductive (CC) (bags)

Continental R-40*	lb.	.2600	.3400
Dixie 5 Dustless*	lb.	.1350	.2100
Dixie Voltex*	lb.	.2600	.3400
Kosmink Dustless*	lb.	.1350	.2100
Kosmos Voltex*	lb.	.2600	.3400
Spheron C*	lb.	.1800	.2400
Voltex*	lb.	.2600	.3400

Channel, Surface Treated (STC) (bags)

Texas 109*	lb.	.0840	.1475

Conductive Furnace Black (CF) (bags)

Aromex CF*	lb.	.0875	.1450
Atlantic CF*	lb.	.0875	.1450
Continex CF*	lb.	.1050	.1550
Croflex CF*	lb.	.0875	.1450
Dixie CF*	lb.	.0875	.1450
Kosmos CF*	lb.	.0875	.1450
Shawinigan Acetylene Black*	lb.	—	.1900
Vulcan C*	lb.	.1100	.1750

REINFORCING AGENTS—CARBON BLACK (Cont'd)

Extra-Conductive Furnace Black (ECF) (bags)

Vulcan XC-72 (pellets)*	lb.	.2500	.3300

Furnace, Fast Extruding (FEF) (bags)

Arovel FEF*	lb.	.0675	.1250
Continex FEF*	lb.	.0675	.1250
Croflex 50*	lb.	.0675	.1250
Dixie 50*	lb.	.0675	.1250
Kosmos 50*	lb.	.0675	.1250
Philblack A*	lb.	.0675	.1200
Statex M*	lb.	.0675	.1250
Sterling SO*	lb.	.0675	.1250

Furnace, Fine (FF) (bags)

Statex B*	lb.	.0725	.1300
Sterling 99*	lb.	.0725	.1300

Furnace, General Purpose (GPF) (bags)

Arogen GPF*	lb.	.0600	.1175
Dixie 35*	lb.	.0600	.1175
Kosmos 35*	lb.	.0600	.1175
Statex G*	lb.	.0600	.1175
Sterling V*	lb.	.0600	.1175
V (Non-Staining)	lb.	.0600	.1175

Furnace, High Abrasion (HAF) (bags)

Aromex HAF*	lb.	.0775	.1350
Continex HAF*	lb.	.0775	.1350
Croflex 60*	lb.	.0775	.1350
Dixie 60*	lb.	.0775	.1350
Kosmos 60*	lb.	.0775	.1350
Philblack O*	lb.	.0775	.1300
Statex R*	lb.	.0775	.1350
Vulcan 3*	lb.	.0775	.1350

Furnace, High Modulus (HMF) (bags)

Continex HMF*	lb.	.0675	.1200
Croflex 40*	lb.	.0675	.1250
Dixie 40*	lb.	.0675	.1250
Kosmos 40*	lb.	.0675	.1250
Modulex HMF*	lb.	.0625	.1200
Statex 93*	lb.	.0625	.1200
930*	lb.	.0675	.1200
Sterling L*	lb.	.0625	.1200
LL*	lb.	.0625	.1200

Furnace, Semi-Reinforcing (SRF) (bags)

Continex SRF*	lb.	.0575	.1150
Croflex 20*	lb.	.0575	.1150
Dixie 20*	lb.	.0575	.1150
Essex SRF*	lb.	.0575	.1150
Furnex*	lb.	.0575	.1150
Gastex*	lb.	.0625	.1250
Kosmos 20*	lb.	.0575	.1150
Pelletex*	lb.	.0575	.1150
NS*	lb.	.0575	.1150
Shawinigan Acetylene Black*	lb.	—	.1900
Sterling NS*	lb.	.0575	.1150
R*	lb.	.0625	.1250
S*	lb.	.0575	.1150

Furnace Super Abrasion (SAF) (bags)

Dixie 85	lb.	.1150	.1650
Kosmos 85	lb.	.1150	.1650
Philblack E*	lb.	.1150	.1550
Statex 160*	lb.	.1150	.1800
Vulcan 9*	lb.	.1150	.1800

Furnace, Super Abrasion, Intermediate (ISAF) (bags)

Aromex ISAF*	lb.	.0925	.1500
Continex ISAF*	lb.	.0925	.1500
Dixie 70*	lb.	.0925	.1500
Kosmos 70*	lb.	.0925	.1500
Philblack I*	lb.	.0925	.1450
Statex 125*	lb.	.0925	.1500
Vulcan 6*	lb.	.0925	.1500

Furnace, Super Conductive (SCF) (bags)

Vulcan SC*	lb.	.1800	.24[illegible]

Thermal, Fine (FT) (bags)

P-33 (c.l.)*	lb.	—	.0575
Sterling FT (c.l.)*	lb.	—	.0575

Thermal, Medium (MT) (bags)

Shellblack*(†)	lb.	—	.0250
Sterling MT (c.l.)*	lb.	—	.0400
MT Non-Staining (c.l.)*	lb.	—	.0500
Thermax (c.l.)*	lb.	—	.0400
Stainless (c.l.)	lb.	—	.0500

REINFORCING AGENTS—SILICA

Cab-o-sil*	lb.	.67	.85
D. C. Silica (pelletized)*	lb.	1.45	1.65
Hi-Sil 233*	lb.	.08	.09½
X303*	lb.	.40	.45
Santocel*	lb.	.62	.64
Valron Estersil*	lb.	2.00	2.25

REINFORCING AGENTS—MISCELLANEOUS

Angelo Shellac*	lb.	.50	.60
Darex Copolymer No. 3*	lb.	.47	.49
43G*	lb.	.39	.41
Darex Copolymer Latex No. 3-L	lb.	.41½	.46
Durez 12687 (and 12707)*	lb.	—	.38½
Durez 13355*	lb.	—	.30
Good-rite Resin 2007*	lb.	—	.41
Hystron*	lb.	.39	.41
Kralac A-EP*	lb.	.39	.41
Lampblack	lb.	—	.12
Marbon S and S-1*	lb.	.36	.43
8000*	lb.	.36	.43
Marmix*	lb.	.39	.41
Pliolite Latex 150*	lb.	.35	.39
Pliolite Resin-Rubber Masterbatches*	lb.	.33	.57
Pliolite NR*	lb.	.93	.95
S6B*	lb.	.36	.43
Plio-Tuf G85C*	lb.	.52	.54
Polyco 220*	lb.	.18¼	.19¼
Polypol S-70*	lb.	.22	.23

RETARDERS

Benzoic Acid TBAO-2*	lb.	—	.44
Dutch Boy Normasal*	lb.	—	.46
ESEN*	lb.	.35	.37
Good-rite Vultrol*	lb.	.62	.64
Harcopol 1183*	lb.	.70	.74
Retarder J*	lb.	.62	.64
PD*	lb.	.37	.39
W*	lb.	—	.42
Retardex*	lb.	.49	.49
Wiltrol P	lb.	.39	.41

RUBBER SUBSTITUTES

Mineral Rubber

Byerlyte*	ton	50.00	57.00
Hard Hydrocarbon (dms.)*	ton	53.00	55.00
Herron Flake*	ton	—	45.00
Mineral Rubber, Solid	ton	42.50	44.50
M. R. No. 38*	ton	55.00	65.00
Witresin	ton	—	52.50

Vulcanized Vegetable Oils

Amberex*	lb.	.29	.36
Brown	lb.	.15	.24
Car-Bel-Lite*	lb.	.3000	.3300
Neophax*	lb.	.17	.27
Polyrez A and C*	lb.	.12	.17
White	lb.	.15	.26

Miscellaneous Rubber Substitutes

G.B. Asphaltenes*	lb.	.06	.06½
Gilsowax B*	lb.	.09	.11
Resin No. 1098 (dms.)	lb.	—	.62
No. 1198*	lb.	.46¾	.49¾
Tysonite*	lb.	.26	.26¾

SOLVENTS

Acetone (dlvd.)	lb.	.11	.12
Amsco Lactol Spirits* (t.c.)	gal.	—	.19
Naphthol Spirits*	gal.	—	.18
Mineral Spirits*	gal.	—	.17
Rubber Solvent* (t.c.)	gal.	—	.18
Solv A* (t.c.)	gal.	—	.24½
Solv A-80* (t.c.)	gal.	—	.30
Solv B* (t.c.)	gal.	—	.28½
Solv B-90* (t.c.)	gal.	—	.32
Solv D* (t.c.)	gal.	—	.30
Solv E*	gal.	—	.30
Solv F*	gal.	—	.30
Solv F-80*	gal.	—	.32½
Solv G*	gal.	—	.42½
Special Naphtholite* (t.c.)	gal.	—	.18
Special Textile Spirits*	gal.	—	.19
Super Hi-Flash Naphtha*	gal.	—	.35
Super Naphtholite*	gal.	—	.18
Textile Spirits* (t.c.)	gal.	—	.19
Amyl Chlorides, Mixed (l.c.l.) (dms.)	lb.	—	.11
Benzol 90%	gal.	.36	.40
Butyl Acetate (t.c.)	lb.	—	.13½
Butyl Alcohol (t.c.)	lb.	—	.13½
Secondary (dlvd.)	lb.	.15	.16
Tertiary (dlvd.)	lb.	.15	.16
Carbon Bisulfide, Tech.	lb.	.0545	.0161

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SOLVENTS (Cont'd)

Carbon Tetrachloride	lb.	.10	.13½
Cosol 1*	gal.	.37	.43
2*	gal.	.42	.48
Cyclohexane	gal.	.77	1.00
85% (c.l.) (dms.)	gal.	—	.30
Cyclohexanone	lb.	.29	.31½
Diacetone, Pure (dlvd.)	lb.	.15½	.16½
Dichlorethyl Ether (dms.)	lb.	.14½	.15
Formal (dms.)	lb.	.30¾	.31¼
Dichloropentanes (l.c.l.) (dms.)	lb.	—	.06
Dicom*	gal.	—	.50
Halowax Oil*	lb.	.28	.41
Heptanes* (t.c.)	gal.	.19	.22
Hexanes (t.c.)	gal.	.19	.22
Isopropyl Alcohol, Ref. 99% (dlvd.)	gal.	.57	.64
Ether, Ref. (dlvd.)	lb.	.09½	.10½
Mersol*	gal.	.43	.7
Mesityl Oxide (dlvd.)	lb.	.15	.16
Methyl Acetone, Syn. (dms., dlvd.)	gal.	.57	.63
Methyl Chloride	lb.	—	.11½
Methyl Ethyl Ketone	lb.	.15	.16
Methyl Isobutyl Ketone (dlvd.)	lb.	.17	.18
Methylene Chloride	lb.	.11¾	.16
N-5 Pentane Mix* (t.c.)	gal.	—	.13½
N-6 Hexanes* (t.c.)	gal.	—	.14½
N-7 Hexanes* (t.c.)	gal.	—	.13½
Penetrell*	gal.	.42	.63
Perchlorethylene	lb.	.11½	.14½
Petrolene* (t.c.)	gal.	—	.14125
Picolines, Alpha, Refined	lb.	.43½	.44
Mixed	lb.	.32½	.33
Proprietary Solvent (dms.)	gal.	.66	.77
Propyl Acetate (t.c., dlvd.)	lb.	—	.11¾
Alcohol (t.c., dlvd.)	lb.	—	.11
Pyridine, Refined	lb.	.74½	.75
Quinoline	lb.	.50	.54¼
Rubber Solvent (t.c.)	gal.	—	.16
Rubsol (t.c.)	gal.	—	.12875
Skellysolve B (Hexanes)* (t.c.)	gal.	—	.158
C (Heptanes)* (t.c.)	gal.	—	.151
R (Rubber Solvent)*	gal.	—	1.29
Solvent, Crude, Light	gal.	.19	.28
Solvesso 100* (t.c.)	gal.	.33	.35
150 (t.c.)	gal.	.33	—
Sunny South DD Dipentine*	gal.	.42	.63
Sunny South DD Pine Oil*	lb.	—	.15
Sunray*	gal.	.1140	.1000
Toluene (dms.)	gal.	—	.38
Toluol (t.c.)	gal.	.33	.35
Trichlorethane	lb.	.13	.13½
Triglycol Dichloride	lb.	.63	.64
Union Thinner 1* (t.c.)	gal.	—	.174
5* (dms.)	gal.	—	.199
7* (t.c.)	gal.	—	.164
2-50 W Hi-Flash*	gal.	—	.41
Xylol	gal.	.34	.38

STABILIZING AGENTS (for Vinyl Resins)

Advastab BC-12*	lb.	.90	.95
BC-74*	lb.	.70	.75
BC-105*	lb.	.75	.80
CH-101*	lb.	.60	.65
CH-201*	lb.	.60	.65
E-82*	lb.	90	.95
JCX*	lb.	.62	.67
L Paste*	lb.	.65	.70
SN*	lb.	.47	.52
T-10*	lb.	1.90	1.95
T-50-LT*	lb.	3.20	3.25
XBZ-155*	lb.	.69	.74
XC-143*	lb.	.90	.95
XE-98*	lb.	.53	.58
Barca 10*	lb.	.75	.80
Barium Ricinoleate (BVS)	lb.	—	.70
Barium Stearate	lb.	.41	.46
Basic Silicate White Lead	lb.	.16	.17
Cadmium Ricinoleate	lb.	—	2.00
Calcium Ricinoleate	lb.	—	.55
Dutch Boy DS-207*	lb.	—	.54
Plumb-O-Sil A*	lb.	—	.29¾
B*	lb.	—	.31¼
Tribase*	lb.	—	.26½
Dythal*	lb.	—	.39½
Ferro 182* (dms.)	lb.	.70	.76
200* (dms.)	lb.	1.33	1.43
203* (dms.)	lb.	.87	.91
541* (dms.)	lb.	.35½	.45½
541A* (dms.)	lb.	.82	.86
700* (dms.)	lb.	.48¾	.58¾
900* (dms.)	lb.	.90	.94
903* (dms.)	lb.	.60	.64
909* (dms.)	lb.	.91	.95
920*	lb.	—	.98
931* (dms.)	lb.	.75¾	.85¾
993* (dms.)	lb.	.89	.99
1203* (dms.)	lb.	1.30	1.40
1206* (dms.)	lb.	1.32	1.36
1820* (dms.)	lb.	.90	.94
1825* (dms.)	lb.	1.00	1.04
1976*	lb.	.47	.51

STABILIZING AGENTS (Cont'd)

Harshaw 1-V-3*	lb.	.43	.45
1-V-4*	lb.	.66½	.70
1-V-7*	lb.	.66	.68
2-V-4*	lb.	.85	.87
2-V-7*	lb.	—	1.10
2-V-8*	lb.	—	1.30
5-V-1*	lb.	.41	.43
7-V-1*	lb.	—	.90
8-V-1*	lb.	.88	.90
8-V-5*	lb.	—	.80
8-V-100*	lb.	.82	.84
9-V-1*	lb.	.70	.72
12-V-5*	lb.	.73	.75
24-V-1*	lb.	1.10	1.12
28-V-2*	lb.	—	1.18
128-V-5*	lb.	.86	.88
Lithium Stearate	lb.	.52	.57
Fluffy	lb.	.47½	.70
Standard	lb.	.52½	.75
Mark C*	lb.	.88	.90
E*	lb.	.72	.75
M*	lb.	.68	.70
PL*	lb.	.63	.65
TT*	lb.	.72	.75
WS*	lb.	.98	1.00
X*	lb.	2.50	2.75
XI*	lb.	.87	.90
XV*	lb.	.88	.90
XX*	lb.	.58	.60
Metasap 613-A*	lb.	—	.69
613-B*	lb.	—	.84
613-C*	lb.	—	1.06
621*	lb.	—	.88
624*	lb.	—	.75
633*	lb.	—	.75
635*	lb.	—	.45
Modicol N*	lb.	.41½	.42½
S*	lb.	.30⅜	.31⅜
Sodium Silicates 41°/1:32	cwt.	1.00	2.10
Stabelan E*	lb.	1.35	1.50
XL*	lb.	.55	.65
HR-50*	lb.	.75	.90
HR Liquid*	lb.	.65	.75
HR Paste*	lb.	.85	.95
HR Powder*	lb.	.95	1.05
No. 110 Liquid	lb.	.65	.75
No. 115 Liquid	lb.	.85	.95
No. 120 Liquid	lb.	.65	.75
Stabilizer No. 52*	lb.	1.90	2.00
89X*	lb.	.75	.80
B-5*	lb.	—	.70
E6B*	lb.	—	.95
G-1*	lb.	1.25	1.40
HR*	lb.	.85	.89
L*	lb.	—	.60
OM-10*	lb.	—	1.95
Staflex OY*	lb.	1.00	1.20
QXMA*	lb.	—	.70
Stayrite 10*	lb.	.34	.36
P-10*	lb.	.41	.43
15*	lb.	.53	.58
20*	lb.	.37	.42
22*	lb.	1.00	1.13
25*	lb.	.35	.40
70*	lb.	.68	.70
71*	lb.	.88	.90
75*	lb.	.59	.62
76*	lb.	.53	.55
80*	lb.	.68	.70
90*	lb.	.68	.70
95*	lb.	.68	.70
229*	lb.	.45	.50
Vanstay C-73*	lb.	.63	.65
HT*	lb.	.87	.90
L*	lb.	.32	.35
N*	lb.	.98	1.00
R*	lb.	.67	.70
S*	lb.	.57	.60
Z*	lb.	.62	.65

STIFFENING AGENTS

Polyac*	lb.	—	1.80
Processing Stiffener 710*	lb.	—	.88
Solvitose HDF, H. C-S, T, and E*	lb.	.22	.25
Versatil Gum 8-E*	lb.	.15	.19

SUN CHECKING AGENTS

Allied AA-1144*	lb.	.23	.24
AA-1177*	lb.	.15½	.16½
Antisol*	lb.	—	.23
Antisun* (Chipped)	lb.	.15½	.17½
(Slabbed)	lb.	.15	.17
Heliozone*	lb.	.31	.32
Microflake*	lb.	.20	.24
Nacconol NRSF*	lb.	.40½	.45
NBC*	lb.	—	1.55
Ross Sunproofing Waxes*	lb.	—	.14½
Sunolite*	lb.	.16	.22
127*	lb.	.16½	.20½
154*	lb.	.23	.25
Sunproof*	lb.	.31	.32
713*	lb.	.25	.26
Improved*	lb.	.25	.26
Super*	lb.	.40	.41
Jr.*	lb.	.20	.21
Tonox*	lb.	.52	.54

SURFACE ACTIVE AGENTS

Anhydrapent*	lb.	.56	.59
Anhydrol 6990*	lb.	.51	.56
6991*	lb.	.51	.56
Aquarex D*	lb.	—	.78
G*	lb.	—	.21
MDL*	lb.	—	.33
ME*	lb.	—	.80
NS*	lb.	—	.60
SMO*	lb.	—	.50
WAQ*	lb.	—	.22
Emulphor EL-620*	lb.	—	.40
EL-719*	lb.	—	.58
ON-870*	lb.	—	.55
Igepal CA-630	lb.	—	.29
CO-630	lb.	—	.29
CO-730	lb.	—	.29
CO-850*	lb.	—	.29
CO-880*	lb.	—	.29
Igepon CN-42*	lb.	—	.25
T-33*	lb.	—	.21
T-51*	lb.	—	.13½
T-77*	lb.	—	.49
Kessco 50201*	lb.	—	.43½
50203*	lb.	—	.46
18201*	lb.	—	.36½
18203*	lb.	—	.36
Pluronic L62*	lb.	.33½	.39
L64*	lb.	.33½	.39
Sellogen Gel*	lb.	—	.12¾
Soybean Lecithin	lb.	.13	.17

TACKIFIERS

Amalgamator Z-4*	lb.	.32	.33
Arcco 620-32B*	lb.	.20½	.21½
716-30*	lb.	.18½	.19½
1041-21*	lb.	.16½	.17½
A-26*	lb.	.18	.19
Bunaweld Polymer No. 780*	lb.	—	.24
No. 5514*	lb.	—	.35
Galex* (dms.)	lb.	.17¾	.18¾
Indopol H-300*	gal.	1.00	1.22
Koresin*	lb.	—	.95
Liquid Rubber Flux*	lb.	—	.14
Nacconal NRSF* (dlvd.)	lb.	.40½	.45
Nilox Resin* (c.l.)	cwt.	—	14.50
Resin V	lb.	—	.23½
Synthol*	lb.	.17	.24¾
Vistac A*	lb.	.21½	.22¼
Vistanex LM Grades*	lb.	—	.45
Zirex* (c.l.)	cwt.	—	14.75

THICKENERS (For Latex)

Alcogum AN-6*	lb.	—	.05
AN-10*	lb.	—	.08½
PA-10*	lb.	—	.12
Betanol* (dms.)	lb.	.70	.95
Gomme Labolene*	lb.	.45	.47
Good-rite K-702*	lb.	.34½	.35
K-704*	lb.	.21	.22
K-705*	lb.	.31	.32
K-707*	lb.	.18	.19
K-708*	lb.	.29	.30
K-710*	lb.	.15	.16
Modicol VD*	lb.	.13⅜	.14⅜
VE*	lb.	.13⅜	.14⅜
Polyco 296 BT*	lb.	.15	.16
296-N*	lb.	.15	.16
530*	lb.	.15	.16
Propylene Laurate (dms.)	lb.	.57	.82
Sodium Silicate, 41°/1:3.2	cwt.	1.10	2.20
Solvitose Series*	lb.	.22	.25

VULCANIZING AGENTS

Selenium

Vandex*	lb.	—	7.50

Sulfur

Aero Brand* (c.l.)	cwt.	—	2.65
Blackbird* (c.l.)	cwt.	—	2.85
Cloud* (c.l.)	cwt.	—	2.80
Crystex*	lb.	.19½	.23
Darex Dispersed Sulfur*	lb.	.14	.16
Devil A* (c.l.)	cwt.	—	2.40
Dispersed Sulfur	lb.	.14	.16
Insoluble Sulfur 60*	lb.	.12½	.13
Ko-Blend IS*	lb.	—	.39
Mist* (Wettable) (c.l.)	cwt.	—	4.00
Spider* (c.l.)	cwt.	—	2.80
Star* (c.l.)	cwt.	—	3.25
Sulfasan R*	lb.	1.55	1.57
Tire* (c.l.)	cwt.	—	2.40
Tube* (c.l.)	cwt.	—	3.25
Vultac 2*	lb.	.47	.49
3*	lb.	.51	.53

Tellurium

Telloy*	lb.	—	2.75

WETTING AGENTS

Advawet No. 10*	lb.	—	.17
No. 33*	lb.	—	.48
Aerosol 18*	lb.	—	.40
AY*	lb.	1.00	1.20
MA 80%*	lb.	.67	.72
OS*	lb.	.39	.45
OT 75% Aqueous*	lb.	.35	.45
OT 100%*	lb.	1.00	1.20
OT-B*	lb.	.85	1.05
Alrosal* (dms.)	lb.	—	.40
Alrosperse*	lb.	—	.18
Anhydrol 6990* and 6991*	lb.	.51	.56

WETTING AGENTS (Cont'd)

Areskap 50*	lb.	.30	.32
Dry 100*	lb.	.60	.64
Aresket Dry 300*	lb.	.60	.64
Aresklene 375*	lb.	.42	.47
Armacs*	lb.	.28	.77
Arquads*	lb.	.42	.61
Emcol 5100* (dms.)	lb.	—	.31
Energetic W-100	lb.	.28½	.35
Etho-Chemicals*	lb.	.26	.58
Ethomeen S/15*	lb.	.48	.50
T/15*	lb.	.46	.48
Kesco E-122* (dms)	lb.	—	.45
18201*	lb.	—	.38½
Kreelon 4D* (dms.)	lb.	.13	.16
8G* (dms.)	lb.	.26	.28
Kyro EO* (dms.)	lb.	—	.29¼
Modicol N*	lb.	.41½	.42½
S*	lb.	.30¾	.31¾
Nacconol SL* (dlvd.)	lb.	.084	.10
60S* (dlvd.)	lb.	.19	.225
Nacconol A* (dlvd.)	lb.	—	.52
Nekal WS-25	lb.	—	.38
WS-99	lb.	—	.95
Orvus AB Granules*	lb.	.15¾	.16¼
Parnol*	lb.	.13	.18
Regal Beads	lb.	.12¾	.16¼
H. D. Beads	lb.	.12¾	.15¼
Santomerse No. 3	lb.	.41	.45
S*	lb.	1.55	1.85
Selapon Gel*	lb.	—	.13
Sorapon SF-73*	lb.	—	.18
SF-78*	lb.	—	.30
Sorbit P*	lb.	—	.28
Soybean Lecithin	lb.	.13	.17
Stablex G*	lb.	.50	.90
Tergitol 4* (dms., dlvd.)	lb.	.32	.33
7* (dms., dlvd.)	lb.	.43	.44
O8* (dms., dlvd.)	lb.	.31	.32
P28* (dms., dlvd.)	lb.	.18½	.19
Trenamine W-30	lb.	—	.15
Vultamol*	lb.	—	.17½
Wetsit Conc.*	lb.	.25	.28

MISCELLANEOUS CHEMICALS

Aquesperse 30*	lb.	—	.11
Arccopel W-18*	lb.	.17	.19
Asbury Graphite*	lb.	.05	1.45
Copper Inhibitor X-872-L*	lb.	—	2.01
D-Tac*	lb.	—	.22
2-Ethyl Hexanol	lb.	.23¾	.24¾
Fura-Tone Resin 1226*	lb.	.41	.43
MODX*	lb.	.32½	.34½
Nacconates* (dms.)	lb.	.99	3.53
Para Resins*	lb.	.04	.04½
Pigmented Filmite* (dlvd.)	lb.	.16¾	—
Resorcin, Tech.	lb.	.77½	.81½
Rio Resin*	lb.	.70	.72
Rongalite CX*	lb.	—	.21½
Sherosopes*	lb.	.13½	.18¾
Sublac Resin PX-5*	lb.	.23½	.24½
Synpep*	lb.	.54	.60
Thiokol LP-2*	lb.	—	.96
LP-3, LP-32, LP-33*	lb.	—	.96
LP-8*	lb.	1.25	1.35
Tysonite*	lb.	.26	.26¾
VA-7*	lb.	—	.50
Vanfre*	gal.	2.45	3.00
No. 3* & No. 4*	gal.	1.95	2.00

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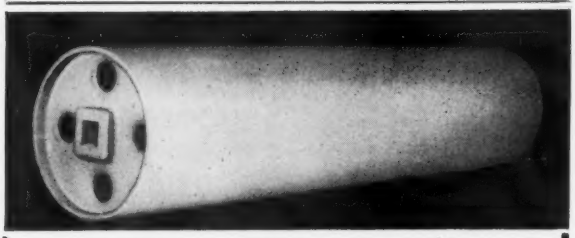

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JULY, 1958

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